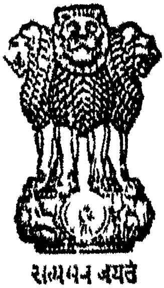

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OF THE

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INCLUDING

THE FARMER'S GUIDE TO AGRICULTURAL RESEARCH

VOLUME 94

(BEING THE NINETY-FOURTH VOLUME ISSUED SINCE THE
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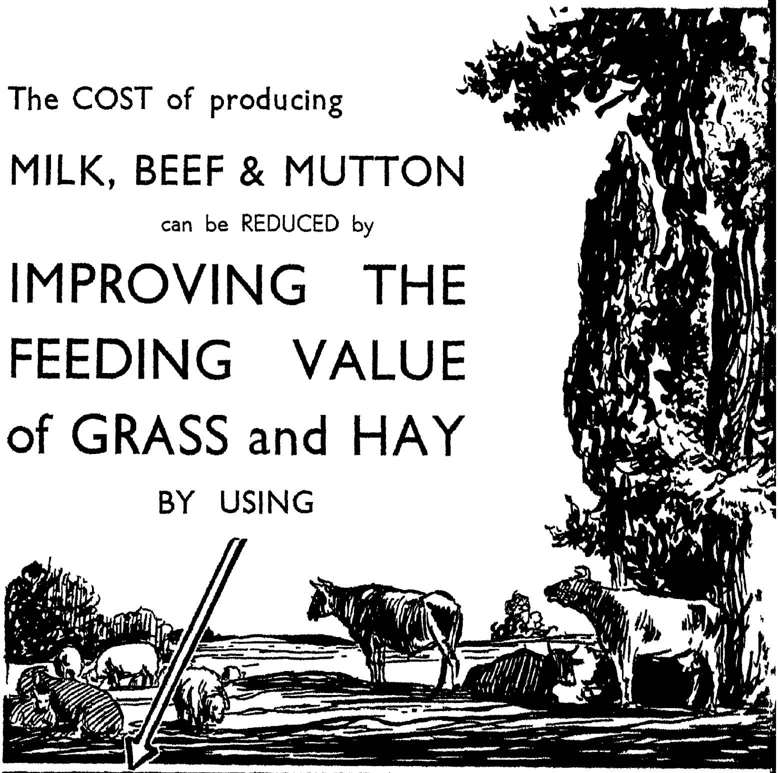

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THE AGRICULTURAL MARKETING ACT, 1933.

As its title suggests, the Agricultural Marketing Act, 1933, is a development from the Act of 1931 of the same title, a short summary of which appeared in a previous issue of this Journal.[1] Taken together, the two enactments form a comprehensive code providing statutory foundations for the reorganization of agriculture and the regulation of supplies of agricultural produce coming on to the United Kingdom market.

In these respects, the Agricultural Marketing Acts bear some resemblance to other recent enactments in the industrial sphere such as the Railways Act, the Electricity Acts, the Coal Mines Acts, and the London Passenger Transport Act. The primary purpose of all these measures is to promote or direct certain fundamental changes in the structure and working of the industries concerned, which experience has shown to be necessary. The changes, moreover, are based on a common principle—variously referred to as reconstruction, rationalization, industrial planning—the essence of which is the co-ordination of individual enterprises in some unified plan of organization applicable to an industry as a whole.

In agriculture, it is on the marketing side that the need for co-ordination is most apparent and, while it must not be assumed that the remedy for all the ills of the agricultural industry is to be found within the scope of the Agricultural Marketing Acts, there can be no doubt that these measures provide the most effective if not the only means of meeting some of the most pressing problems of the industry under the present chaotic conditions of world production and trade.

[1] Vol. 92, 1931, pp. 273–5.

THE ACT OF 1931.

In order to comprehend the Agricultural Marketing Act, 1933, it is necessary to bear in mind the main provisions of its predecessor of 1931.

The earlier Act deals exclusively with the marketing of agricultural commodities produced in Great Britain. It is an "enabling" measure, that is, it provides the means whereby producers, if they so desire, may organize themselves, nationally or locally, for the better marketing of their products. Each product or group of related products must be the basis of a separate marketing scheme, to be administered by a board composed of the elected representatives of the registered producers concerned.

The procedure under the Act is as follows :—

A scheme may be submitted only by producers, although assistance in the preparation of a scheme may be provided by the Minister through a Reorganisation Commission. If the Minister accepts the submission of the scheme, it must be given publicity in order that its provisions may be widely known, and it is open to any person affected to make representations or objections. If objections are made and are not met or withdrawn, a public enquiry must be held. The scheme—as modified by the Minister—has then to be laid before both Houses of Parliament for approval or rejection. The final decision as to whether the scheme shall come into full operation or not, rests, however, not with the promoters, nor with the Government nor with Parliament, but with the producers themselves. For this purpose, a poll of producers must be taken and a two-thirds majority of those registered, having reference to numbers and output, must be secured.

This is, perhaps, a somewhat complicated procedure. It is necessary because the statutory powers contained in the scheme may after it has been approved be exercised not merely over the producers who voted for it but over *all* producers in the area to which the scheme applies. Moreover, these powers may be, in some cases, very extensive. The Board may be empowered to buy, sell, grade, advertize and transport the regulated product as well as to engage in processing the product and the sale of the processed article. If the scheme so provides, the Board may become the *sole* buyer of the regulated product in the area covered by the scheme. Alternatively, a scheme may empower the Board simply to *regulate* sales without itself undertaking any trading. For this purpose it may, among other things, determine the descriptions of the product which may be sold by any registered producer, the price at which it may be sold, the terms of sale and the persons to or through the agency of whom it may be sold. Where necessary, a Board may be equipped with both trading and regulatory powers. As is indicated below,[1] these powers have been amplified in several important respects by the Act of 1933.

In short, the purpose of the agricultural marketing code, so far as it relates to marketing schemes, is to make available for producers all the powers of industrial self-government that may conceivably be necessary or desirable to enable them as a group to secure effective control over the marketing of their produce. It is to be presumed that producers' boards administering these schemes will be guided by a due sense of responsibility towards not only their constituents but the other interests concerned. There are, however, various statutory safeguards. Producers have the right to appeal to arbitration. The interests of consumers are to be watched by a Consumers' Committee, and a Committee of Investigation will consider matters reported from a Consumers' Committee or complaints from parties other than consumers on the working of a scheme. Finally, the Minister may, in extreme cases, exercise his power to revoke a scheme subject, to the approval of Parliament.

THE NEXT STEP—REGULATION OF TOTAL SUPPLIES—DEVELOPMENT SCHEMES.

The provision of a rational and effective basis for the organization of home supplies was an achievement of the greatest importance for the future of British agriculture. It is true that producers were at first a little hesitant in making use of the Act, though a scheme for the hop industry was promptly put in hand and successfully brought into operation, but their hesitation was certainly not because of any special attachment to the existing marketing system. On the contrary, dissatisfaction with its anarchic and wasteful methods was freely expressed, and there was general agreement that drastic reforms were long overdue. The widespread interest shown in the Economic Series of Reports—the Orange Books—issued by the Ministry of Agriculture and Fisheries, which embodied the results of investigations into the marketing of various commodities was, in itself, significant.

With the onset of the world crisis, however, the agricultural problem assumed a new and extremely menacing shape. During the previous decade, great progress had been made, as a result of the combined efforts of scientists, engineers and practical farmers, in the technique of agricultural production, leading to remarkable improvements in average yields per unit in crops and livestock as well as to the advance of the agricultural frontier into hitherto undeveloped regions. For a while, the inevitable increase in world production of some of the principal agricultural commodities was absorbed without much difficulty, but, gradually, unmistakable signs of over-production made their appearance—first in the products of tropical agriculture, such as rubber, sugar and coffee and, later, in the agriculture of the more temperate regions in commodities such as wheat, wool and dairy produce.

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[1] pp. 18–20.

To what extent the economic system could have taken up the strain which this sharp expansion of agricultural output imposed upon it, had this been the only set of forces making for disequilibrium, is an open question. As it happened, other disruptive factors—such as monetary disturbances and technological changes in manufacturing industry—were at work at the same time, the combined effect of which was to bring about a reversal in the movement of the barometers of world industry and trade, leading, in the end, to a more or less complete breakdown of the exchange mechanism over the greater part of the world.

The response of manufacturing industry to the crisis was, of course, the progressive curtailment of production involving the rapid spread of unemployment and the consequent diminution of consumer purchasing-power. In agriculture, however, the consequences were even more serious for the producer. As a distinguished agricultural authority has said, " Agriculture is a personal industry. In a period of depression, the farmer cannot close his shop for he is both owner and labourer. His family must live and his taxes and interest must be paid. If wheat brings little per bushel, he must try to produce more bushels ".[1] The biological basis of agriculture also militates against the rapid adjustment of agricultural production to declines in demand. To quote from the same authority, " If a manufacturer closes his plant, it will be there when he wants it again. A farmer cannot stop feeding his pigs and horses. He cannot stop his cropping if he wants to start it again ".[2] Moreover, even if he does reduce his acreage, his neighbours, in the absence of any general agreement, may increase theirs, or a bountiful harvest may increase his total yield.

In the circumstances, as the crisis spread and deepened, surpluses which might have been manageable in prosperous times became portentous masses overhanging the markets and, with the precipitous fall in the purchasing-power of consumers, even normal supplies could no longer be absorbed at remunerative prices. The result was that, between 1929 and 1932, the

[1] G. F. Warren (and F. A. Pearson)—*The Agricultural Situation, p.* 23.

[2] Ibid.

prices of most of the staple agricultural commodities fell by 50 per cent. or more, while agricultural production, as a whole, showed little or no decline, and the production of some commodities increased considerably.

When the failure of the automatic mechanisms of adjustment became apparent, exporting countries in some instances sought to dam back the flood of supplies by various kinds of restriction schemes, for example, in the cases of sugar and coffee, or by means of costly holding policies, such as those of the United States Federal Farm Board ; others, again, sought to improve the lot of producers by export subsidies. The European and other importing countries responded by strengthening their tariff walls wherever there existed a home industry likely to be affected by the weak selling of voluminous supplies from abroad, or adopted other methods for the purpose of maintaining internal prices at a remunerative level.

Accordingly, the United Kingdom, which remained the one wide-open market, experienced an unparalleled inrush of imported food and raw materials, stimulated, to a high degree, by the heavy depreciation in terms of sterling of the exchanges of some of the principal exporting countries. It was clear that it would be useless to ask the home producer, who, in most branches of agriculture, has to compete directly with imported supplies, to proceed with the new and difficult task of domestic reorganization under the Act of 1931 while his market was in danger of being demoralized by the unregulated flow of imported supplies. In order to give producers the required incentive, some assurance was necessary that (1) in the existing disturbed conditions, effective steps would be taken, where necessary and practicable, to control the flow of imported produce, and that (2) with the return of more settled conditions, regulation of imports would form part of a general system of supply regulation in which provision would be made, wherever possible, for the steady and planned expansion of home production.

This was recognized by the Government in a statement on agricultural policy made on 11th February, 1932, by Sir John Gilmour, then Minister of Agriculture and Fisheries. This statement referred, in part, to proposals for immediate action, and, in part, to a long-range policy. The former related principally to the measures designed to extend the system of protective duties to certain agricultural products and to a special scheme for wheat, which later became the Wheat Act, 1932. In the words used by the Minister, the long-range policy was " designed to facilitate economic development in those branches of the agricultural industry which are likely to be most remunerative, and particularly those which lend themselves to most rapid development." Three products were mentioned, namely, milk, bacon and potatoes. In each case, it was indicated that the Government was prepared to assist in the formulation of schemes under the Agricultural Marketing Act, 1931, in order to enable development to proceed on planned and organized lines, with the assurance that, where necessary, suitable complementary action would be taken with regard to imports of these products. As regards bacon, it was stated that "the preparation of a scheme for the organization of the bacon industry will be undertaken forthwith and, provided a feasible and satisfactory scheme is evolved, *the Government will be prepared to promote some form of quantitative regulation of imports*." Here was the germ of a policy, which in due course found statutory expression in the Agricultural Marketing Act of 1933.

In accordance with the Minister's announcement and with the full support of the representative organizations of producers, Reorganisation Commissions were set up, under the Agricultural Marketing Act, 1931, to consider and prepare suitable schemes for milk and for pigs and pig products, and, in due course, their Reports were submitted. In the case of milk, the provisions of the scheme as finally put into operation were, for the most part, covered by the Act of 1931. The recommendations of the Pigs and Pig Products Commission, however, involved two fundamental issues of policy, for which new legislation was necessary. These were :—(1) the establishment of a system of supply-regulation, and (2) the organization of the *production* of a secondary agricultural product under a development scheme, and they form, respectively, the subjects of Part I and Part II of the Agricultural Marketing Act, 1933. To this extent, and with the important qualification that the provisions of the Act are applicable not merely to pigs and pig products, but to any product covered by the original Act, the Report of the Reorganisation Commission for Pigs and Pig Products may be regarded as the immediate progenitor of the Act of 1933, which Mr. Elliot, the present Minister of Agriculture and Fisheries, introduced in the House of Commons on 13th March of that year.

Meanwhile, at the Imperial Economic Conference at Ottawa in the summer of 1932, the United Kingdom Government agreed with the Dominions on a five-year programme of quantitative regulation of foreign supplies of frozen meat. This programme was given statutory effect in the Ottawa Agreements Act, 1932, and came into operation on January 1, 1933. It was designed primarily to give the Dominions an expanding share of the United Kingdom market for frozen meat, as well as to bring about an improvement in the price of that commodity. To assist in this latter purpose, Australia and New Zealand gave undertakings with respect to their shipments in 1933. Subject to certain conditions, the United Kingdom recovers freedom of action to regulate the volume of Dominion supplies of frozen meat after 30th June, 1934, and Dominion supplies of eggs, poultry, butter, cheese and other milk products after August, 1935. As regards bacon and hams and other pig products, the Ottawa Agreements broadly envisaged the system of supply-regulation now in operation.

THE ACT OF 1933.

The Agricultural Marketing Act, 1933, is not a simple measure ; it comprises 30 sections and 4 schedules. In addition to giving effect to the basic proposals of the Reorganisation Commission for Pigs and Pig Products, it contains a number of minor but important amendments to the Act of 1931 as well as certain miscellaneous provisions. It is divided into four main parts, each of which corresponds to a logical division of the subject matter of the statute.

Part I. Regulation of Supply.

Part I is probably the most controversial part of the Act and, in itself, justified the Minister's description of the Act as " drastic, far-reaching and novel." As illustrating the attention which this Part received in Parliament, it may be noted that out of a total of nearly 200 amendments put down for consideration in Committee of the House of Commons, over one-third related to Part I. Some of these amendments were, of course, of a purely drafting character, others involved questions of interpretation and others again involved fundamental questions of principle. In order that the details may be seen in their proper perspective, consideration must first be given to the general principle of supply-regulation which the Government is putting into operation as a part of its general commercial and agricultural policy.

The Principle of Supply-Regulation.

The policy of supply-regulation has its short-term and its long-term aspects. As regards the short-term aspect, the policy is based on the principle that a rise in the prices of primary produce is essential for the revival of trade and industry. This principle was affirmed by the United Kingdom Delegation at the Ottawa Conference in 1932 and accepted by all delegations as a fundamental principle of Imperial policy. It was also unanimously endorsed at the World Monetary and

Economic Conference in 1933. The policy of the United Kingdom is accordingly to take all practicable steps to bring about (1) a sounder level of prices for the home producer, and (2) in doing so, to have regard to the need for a general recovery in world prices of primary commodites. Needless to say, this latter objective is not pure altruism. The United Kingdom is, of course, by far the largest international market for agricultural products. When, as at present, this market is in danger of being glutted, not only is British agriculture threatened with disaster, but the export trades, with the labour and capital employed in them, and British overseas investments, which are, for the most part, in the main agricultural exporting countries, are also affected.

The Reorganisation Commission for Pigs and Pig Products, in recommending the adoption of a " quota system " for home and imported supplies of bacon, assumed that compulsory powers would be necessary, and such powers are accordingly provided in Part I of the Act.[1] Valuable experience had, however, been gained of the possibility of regulating imports on voluntary lines. In November 1932, emergency action had to be taken to reduce the volume of meat imports, in order to avoid a serious collapse of prices. Similar action had to be taken in the early summer of 1933, in the case of processed milks. In each case, and more recently also as regards potatoes, the regulation of imports was effected by means of voluntary agreements with the supplying countries or importing interests concerned and was, in effect, a regulation of exports rather than imports, the machinery for enforcing the agreements being operated at the exporting end. In the case of frozen meat, the position is somewhat different, since there is a statutory obligation to regulate imports under the Ottawa Agreements Act. Though the negotiations which these supply agreements involve are difficult in the extreme, the task of actual administration is not heavy. In practice, there has been the minimum of interference with the organization of the import trade and very little expense has been incurred by the United Kingdom Government. The willingness of exporting countries to co-operate in these emergency arrangements, which were necessary in the interests of all producers concerned, home, Dominion and foreign, encourages the hope that the Government's long-term policy of supply-regulation may also be achieved without resort to compulsory powers or, at any rate, may continue to be operated from the exporting end with a large measure of agreement on the part of the exporting countries concerned.

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[1] An order under Section 1 of the Act for the regulation of imports of bacon was made by the Board of Trade on November 7, 1933.

The quantitative regulation of imports is, of course, to be regarded not as an end in itself but as an essential part of the machinery for securing and maintaining both the stability of the United Kingdom market as a whole and the expansion, wherever practicable, of the home producer's share of the market. The policy, so far as the home output is concerned, is based four-square on the organization of home producers under the Agricultural Marketing Acts. Parliament has, in fact, made it clear in the Act of 1933 that the quantitative regulation of imports is to be contingent on the organization of home agriculture. For only thus would home producers be in a position to play their part in a comprehensive system of supply-regulation in which *total* supplies are regulated in accordance with the needs of the market. Organization is also required in order that the *expansion* of home production may be regulated, both in the interest of the producers themselves and in the national interest.

Is it possible to catch here a glimpse of the future organization of the international trade in agricultural products ? If other countries are prepared to co-operate and to regulate their sendings to this market, might not supply-regulation eventually take the form of a system of supply-agreements under which, consistently with national policies, the organized producers in this country and abroad jointly assume the responsibility for the determination and allocation of market supplies and for the administration of the arrangements as a whole ? If, eventually, this is found to be practicable, the powers provided in the Act of 1933 would be held in reserve for the purpose of safeguarding the system and providing such support as the arrangements may require.

Notes on Sections.

Part I of the Act comprises three Sections, the first of which relates to the regulation of imports, the second to the regulation of home supplies, while the third provides for the establishment of an advisory committee to be known as the Market Supply Committee. These Sections embody, in a general way, the main proposals of the Reorganisation Commission for Pigs and Pig Products with respect to the quantitative regulation of supplies.

(*a*) *Section* 1. *Regulation of Imports.* The main provisions of this section are as follows :—

The Board of Trade is empowered to regulate by Order the importation of any agricultural product (the definition of which includes not merely raw products but also any article of food or drink wholly or partly manufactured or derived from such a product) after consultation with the Minister of Agriculture and Fisheries and the Ministers responsible for agriculture in Scotland and Northern Ireland. In the Order, the Board may specify the period for which it is to operate and the quantity and description of the product which may be imported. There is also a provision enabling the Board to set up machinery for the effective operation and enforcement of an Order.

Before making an Order, the Board of Trade must be satisfied (1) that all practicable and necessary steps have been or are being taken for the efficient reorganization, by means of schemes under the Agricultural Marketing Acts, of those branches of the agricultural industry of the United Kingdom in whose interests the Order is made, and (2) that, without an Order, the effective organization and development of the home industry cannot be secured or maintained. Further, in deciding whether an Order shall be made or in settling the terms of the Order, the Board is required to have regard to (*a*) the interests of consumers of the product to which the Order relates, and (*b*) to the effect which the regulation of importation is likely to have upon commercial relations between the United Kingdom and other countries. The Board may not make an Order at all unless satisfied that it is not at variance with any treaty, etc., between the United Kingdom and any other countries. It is later provided—Section 26—that any Order made under Section 1 will have to be laid before Parliament and be subject to an affirmative resolution of both Houses.

There is, of course, no special significance in the fact that whereas the Minister of Agriculture and Fisheries, in conjunction with the Ministers concerned with agriculture in Scotland and Northern Ireland, is responsible under Section 2 of the Act for regulating home supplies, the Board of Trade, subject to consultation with the Agricultural Ministers, is responsible for Orders regulating imports. This division of executive responsibility does not and cannot affect in any way the conduct of Government policy.

A point of much greater significance concerns the conditions to be fulfilled before an Order can be made. The first of these requires satisfactory evidence to be given that such steps as are practicable and necessary have been or are being taken for the efficient reorganization of those branches of the agricultural industry in the United Kingdom in whose interests the Order is made. The words " such steps as are practicable and necessary " may be regarded as including the appointment of a Reorganisation Commission under the 1931 Act.[1] The provision, however, is so phrased that it would *exclude* " window-dressing " schemes put forward merely for the purpose of securing an Order regulating imports and also purely local schemes, *i.e.* schemes not applicable to the country as a whole.[1] It will be noticed also that an Order is to refer to a particular product, whereas the proviso as to domestic reorganization relates to "*branches* of the agricultural industry of the United Kingdom." An Order for the regulation of imports of condensed skimmed milk could, for example, be made without requiring that home-produced supplies of condensed skimmed-milk should be organized under the Agricultural Marketing Acts ; it could be made, provided that the branch of the home industry affected, that is, the dairy branch, were the subject of an appropriate scheme.[2]

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[1] House of Lords, *Official Report,* Vol. 88, No. 61, p. 292.

(*b*) *Section* 2. *Regulation of Home Supplies.* This Section enables the Ministers responsible for agriculture in the United Kingdom, where the importation of an agricultural product is regulated by means of an Order under Section 1 or by voluntary arrangements, to regulate the home output of the product or any related product by means of an Order affecting sales. Before making an Order under this Section, the Ministers must be satisfied that it will conduce to the more efficient organization and development of a branch of the agricultural industry or is necessary to secure the economic stability of a branch of the industry. They must also consult the Board of Trade and the Market Supply Committee and, if the product is regulated under a marketing scheme, the Board administering the scheme, before the Order is made. Sub-sections 2 and 3 indicate that it is the intention that the Ministers shall, whenever possible, work through marketing boards, which will themselves possess or can be given the requisite administrative power and will provide the administrative machine.

Broadly, the purpose of Section 2 is to enable the regulation of home supplies to articulate with the regulation of imports in the interests of market stability. This is necessary, for it is certain that public opinion would not consent indefinitely to any one-sided arrangement which, in effect, placed consumers at the mercy of irregular home production. As was pointed out by the Reorganisation Commission for Pigs and Pig Products, it is also in the interests of home producers that expansion when it occurs should be orderly and in conformity with a well-conceived plan, so that room may be found for a given increase in home supplies without endangering the stability of the market as a whole, or, it may be added, disturbing with undue violence the working of the distributive machine. It should be noted, however, that the Ministers are not compelled to make an Order under this Section whenever imports are regulated either by an Order or by voluntary arrangements. An Order under Section 2 would, however, be required if a Marketing Board or a Development Board were not already equipped with the powers to regulate home supplies effectively in an emergency.

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[1] *Op. cit.*, p. 290.

[2] House of Commons, *Official Report*, Standing Committee C., 1st day's Proceedings, p. 25.

(c) *Section* 3. *Establishment of a Market Supply Committee.* This Section provides for the setting up of an advisory body, as recommended by the Reorganisation Commission for Pigs and Pig Products, but in a form which retains full Ministerial responsibility. The Committee will be an expert, standing body consisting of a chairman and not more than four other persons.

The functions of the Committee are defined in Sub-section (2). In general, it will be the duty of the Committee to keep under constant review any matters affecting the supply of, and demand for, agricultural products—whether home-produced or imported—and, for this purpose, questions of price and quality will, in particular, come within its province. It will be the task of the Committee to find out more than is generally known at present about prospective supply and demand and about the probable effects on consumption of changes in the quantities of any product available for the market, including such important questions as the substitution of one product for another, composite demand, etc. It will also advise Ministers on the steps which should be taken for regulating supplies. This is its function as regards policy and here it will make recommendations on its own initiative, although, in considering the recommendations of the Committee and deciding how far they should be followed, Ministers will continue to need the advice of their own Departments. The other function of the Committee is to assist and advise Ministers on all matters concerning the discharge of their functions under Part I of the Act and on any arrangements for the regulation of imports, and in this way to furnish them with the independent judgment, on the working out of Ministerial policy, of men of distinction in whom the public will have confidence. In other words, the Committee will watch the operation of the whole machinery of supply-regulation and give their advice on any practical problems and difficulties that may, from time to time, arise. For this purpose, it may be desirable to provide them with the help of trade advisory sub-committees.

Part II. Development Schemes.

At first sight, there might appear to be but little connection between Part I and Part II of the Act. Nevertheless, two fundamental principles are common to both, namely the principles of co-ordination and economic planning.

The policy of supply-regulation makes use of these principles by projecting them, as it were, along a horizontal plane. It begins with the individual producer who is supplying an international market and who is subject to the continuous risks and vicissitudes of that market which he alone can seldom foresee, still less mitigate or avert. Its first task is producer-organization on a national scale. Its ultimate objective may be said to be international producer-organization on the lines of a cartel. Through organization under the Act of 1931, home producers as a body will be in a position corporately to control their marketings where individually they were powerless. Having set their own house in order, they will be in a position to co-operate in any scheme of supply-regulation initiated unilaterally by the United Kingdom Government and affecting all sources of supply, or to make and maintain contact with similar organizations of producers abroad with a view to planned and co-ordinated action for securing the stability of the market as a whole. In the latter case, Part I of the Act would be of service in providing, as it were, a reserve police system to be brought into action only where necessary for the reinforcement of the administrative arrangements mutually agreed between the participating national groups of suppliers or for controlling the operations of irresponsible outsiders.

This horizontal co-ordination, however, represents only one side of the picture. While some agricultural products reach the consumer in substantially the same form as they leave the producer, there are many others which must undergo some form of processing or manufacture. In these cases, the horizontal organization of primary producers and producers of related secondary[1] products under the Act of 1931 is not the only form of co-ordination required. It is clear that the producer's interest in his product does not and cannot stop when it reaches the factory door. If processing capacity is inadequate or excessive or is badly situated in relation to supplies of raw material and if, for these or other reasons, processing costs are unduly high, the primary producer suffers. It is, however, also clear that producers of secondary products cannot operate to the fullest degree of efficiency unless the supply of raw material is properly adjusted, quantitatively and qualitatively, to the demand for the manufactured product. To meet these problems, vertical co-ordination, that is, co-ordination between the organized producers of a primary product and of the related secondary products, is also required in order that, together, they may put into operation carefully-formulated schemes for *the rationalization of the production of the secondary products.* The purpose of Part II of the Agricultural Marketing Act, 1933, is to provide the machinery and powers necessary for this task.

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[1] A secondary product may be defined as an agricultural product, wholly or partly manufactured or derived from a primary product, *e.g.* bacon, cheese, cider, sugar, etc.

The following are the main provisions of Part II :—

Schemes—referred to as development schemes—may be submitted to the appropriate agricultural Minister by any two or more boards administering marketing schemes under the Act of 1931, provided that at least one of the boards submitting a scheme is a board for regulating the marketing of a secondary product and at least one a board for regulating the marketing of an agricultural product from which the secondary product is derived. A point of some interest is that the scope of a development scheme may, in certain circumstances, extend to Northern Ireland. The purpose of a development scheme is to organize, in connection with these marketing schemes, the production of the secondary product, but *not* the production of a primary product. Thus, a Great Britain pigs marketing board and a Great Britain bacon marketing board could jointly submit a development scheme for bacon produced in Great Britain ; similarly a Great Britain sugar-beet marketing board and a Great Britain sugar marketing board could submit a development scheme for the organization of sugar production in Great Britain ; a flour marketing board for England and a bread marketing board for England could submit a development scheme for regulating the production of bread in England ; or a number of milk marketing boards together covering the whole of Scotland and a cheese marketing board for Scotland could jointly submit a development scheme for organizing cheese production in Scotland. In the Act itself, one product, namely, bacon (including hams), is specifically mentioned as being a product to which Part II may be applied, but the provisions of this Part may be extended to other secondary products by an Order approved by each House of Parliament (Section 7).

The method of bringing a development scheme into operation follows the democratic principle of the 1931 Act in providing that it may only be submitted by the future constituents of the development board, that is, in this case, the producers' marketing boards. The machinery relating to the submission and approval of schemes is rather simpler than that provided in the original Act for marketing schemes. All that is necessary in the case of development schemes is that due provision should be made for the advertisement of the scheme, for consideration of objections and representations and for the making of Ministerial modifications by agreement with the boards submitting the scheme. Before laying the scheme before Parliament for approval, the Minister must be satisfied that each of the constituent marketing boards has held a meeting of its registered producers and secured their approval thereto. The machinery for amendment and revocation of schemes is similar to that of the principal Act for marketing schemes.

Section 5 provides for the constitution of the development board to administer a scheme. In addition to a number of persons to be elected by the constituent marketing boards, three persons, including the Chairman of the board, are to be appointed by the appropriate Minister. This is a departure from the democratic principle of the 1931 Act. The reason is that, while it is a presumption behind a marketing scheme that producers have common interests in all matters of chief importance, the marketing boards (*e.g.* pigs and bacon) submitting a development scheme, though they have many common interests, are bound to have conflicting interests in certain important matters. On such matters, the independent members may be expected to exercise a mediating and judicial influence. The function of the independent members being to guide and not to control, they will not, unless the scheme so provides, form a majority on any board.

Section 6, which prescribes, *inter alia,* the powers which may be taken by development boards is, of course, the mainspring of this Part of the Act. To enable a board to acquire effective control over the production of the secondary product, all producers, unless exempted under the scheme, may be required to hold a licence to be granted by the board in respect of the premises in which the product is manufactured. The licence will, moreover, be " subject to such conditions as the board, having regard to the interests of the persons registered as producers under related marketing schemes, think necessary for promoting efficient production of the said product . . . or for preventing or reducing excessive production of that product." Any person who produces the product in contravention of the provisions of the scheme is liable to heavy penalties—including imprisonment.

It is easy to envisage what the licensing conditions might be. In pursuance of the two objectives, the licence could specify the conditions under which the secondary product may be produced ; it could specify the quantity or the quality of the article which may be produced ; it could specify even the methods of production. The machinery of licensing could also be used for the regulation of new factory construction in order to ensure that new factories will be provided only when there is a need for them, having regard to the capacity and suitability of existing factories. It could be used so as to ensure that when new factories are required, they are properly designed and constructed and that they are properly located, having regard not only to the usual efficiency tests, *i.e.* power, communication, etc., but also to the convenience and production possibilities of producers of the raw agricultural product.

The power to licence may, if necessary, be coupled with the power to purchase by agreement and subsequently dispose of any existing production unit where necessary " for the purpose of preventing, eliminating or reducing inefficient or excessive production of the secondary product." (Sub-section (2).) The funds required by a board for this purpose and for any other expenses of the board under a scheme are to be obtained from the proceeds of a levy from the constituent marketing boards.

These two powers, *i.e.* the power to license and the power to deal with unwanted capacity, comprise virtually the whole armoury of rationalization. The power to rationalize, however, must always be subject to equitable treatment being accorded to the persons affected. For this purpose, Section 6 contains four important safeguards, three of which relate to the licensing powers of boards ; the fourth is general. In Sub-section (1) (i) it is provided that a producer's licence shall not be refused, in respect of premises in which the secondary product was produced six months prior to a " relevant date ", before the expiration of a certain period, being not less than one year or more than two years from the day on which the scheme comes into force. The " relevant date " means, for schemes submitted during 1933, the 1st March, 1933, and for schemes submitted after that year, the date on which the notice of submission of the scheme was first published.

Sub-section (1) (ii) makes the general proviso that licences shall not be refused except on such grounds as are specified in the scheme.

Sub-section (3) (*a*) *requires* every development scheme to provide for the payment of compensation to applicants for a producer's licence who are aggrieved by the refusal of the board to grant a licence or by any conditions attaching thereto.

The fourth and general safeguard is in Sub-section (3) (*b*), which requires every development scheme to make provision for securing that producers or would-be producers of the secondary product in the area of the related marketing scheme for that product, who are aggrieved by any act of or omission of the development board, may refer the matter to arbitration.

In addition to the two main instruments of rationalization with which a development board may be equipped, a number of other powers may be taken under Sub-section (4) *if the boards promoting the scheme so desire.* These include (*a*) power to the board to exercise the more important of the trading or regulatory powers exercised by a constituent marketing board (including the determination of prices), (*b*) power to obtain information from holders of producers' licences, (*c*) power to inspect premises used for producing the secondary product in the area to which a related marketing scheme relates, (*d*) power to encourage, promote or conduct education and research and (*e*) power to provide for incidental or consequential matters relating to the provisions of the scheme.

Part II of the Act thus places the agricultural industry and its satellite manufacturing industries in a position to take the lead in the process of structural and functional transformation which is being rapidly pressed forward not in this country only but over the whole world. In the United States, for example, there is the Industrial Recovery Act, under which a planned régime is being inaugurated in all the basic industries through a system of " codes ". The movement differs from the movement in this country, being more spectacular and, in its broader sociological implications, it is undoubtedly closely akin to the idea of the " Corporative State ". The general lines and provisions of the *industrial* codes, however, which are now being promulgated in one industry after another, offer a striking parallel to those of development schemes under Part II of the Agricultural Marketing Act, 1933. In each, the principle of self-regulation is preserved. In the American plan the formulation of schemes is left to trade associations, each of which is representative of the employers in a particular trade or industry. To enable the trade associations to chart a course of co-ordinated action or, as it is termed, " to plan for a better future for the longer pull," the restrictive provisions of the Anti-Trust laws have been removed. Under the new disposition, every association has effective control over the industry which it represents, its powers including authority to regulate output, fix prices and control the construction of new factory capacity. The Lumber Code Authority may, for example, establish and allot individual production quotas and secure their enforcement throughout the whole industry. It may also establish minimum prices to apply to the sale of imported timber as well as the domestic product. It may petition the Government to take steps to regulate, to the extent of prohibition if necessary, the importation of timber products. Similar codes have been or are being worked out for the cotton, coal and steel industries.

The sweeping changes which are now being made in the organization of American industry have undoubtedly exercised a profound influence on industrialists everywhere. Nevertheless, the principle of economic planning, which burst on

America with all the force of a religious revival, has for years been a powerful factor in transforming the basic industries of this country. The coal, iron and steel, and shipbuilding industries of Great Britain provide striking instances of economic planning in motion. The scheme for the reorganization of the coal industry in West Yorkshire, which has recently been conditionally approved by the Coal Mines Reorganization Commission, is an example which, in many respects, follows closely the lines along which development schemes under Part II of the Agricultural Marketing Act, 1933, may operate.

The West Yorkshire coal scheme is intended to promote the planning of the coal industry by curtailment of surplus production, the elimination of price cutting, and the co-ordination of marketing, without, however, sacrificing the separate identity of its constituents. Under the scheme, the Executive is empowered to bring about concentration of production by negotiating for the closing of selected mines. The closing may be temporary or permanent and may be brought about either by means of arrangements for compensation or outright purchases, subject, in each case, to the right of owners to demand arbitration. All undertakings in the Federation must contribute to a compensation fund and would be entitled to share in the distribution of the "permissible output" of a closed mine. On the sales side, regulations for the co-ordination of marketing, if approved by a stipulated majority of the constituents, will be made binding upon all. These regulations may include the introduction of standard conditions of sale; the determination of a price, for any particular class of business, below which coal must not be sold; the means whereby all constituents supplying a common market may agree upon the price and terms of sale for such market; and the introduction of co-operative selling.

The scheme, like development schemes under the Agricultural Marketing Acts, will have statutory force; certain of its provisions are binding on all producers. The real driving force behind the scheme is, however, in each case, the conviction of the great majority of the producers that planned production and co-ordinated marketing are the two fundamental prerequisites of sound development and enduring prosperity.

Part III. Amendments of the Agricultural Marketing Act, 1931.

The more important of these amendments may be summarised as follows:—

Section 10 enables a marketing board to determine the *quantity* of the regulated product or of any description thereof, which may be sold by a registered producer. This power is necessary in order to enable a board to act either on its own initiative or as the Minister's executive under Section 2 of this Act in regulating sales of the home product. As a safeguard to registered producers, the Section further provides that the method of determining the quantity of the registered product which may be sold by a registered producer must be specified in the scheme and may have reference to past production either on particular premises or by particular persons. This method of determination is, of course, desirable as a protection to established producers *vis à vis* new producers.

Section 11 enables the Minister to extend the powers of marketing boards by Order mainly for the purpose of enabling a board to play its part in a scheme of supply-regulation under Part I of the Act.

Section 12 provides the powers necessary to enable a board to administer a pooling scheme, such as the Milk Marketing Scheme, when producers continue to effect their own sales.

Section 13 also arises out of the Milk Marketing Scheme. It enables a board administering a marketing scheme to negotiate with any other person in respect of any matter concerning the marketing of the regulated product or derivative products and to agree to refer any question in dispute to an arbitrator nominated by the Minister. The Section thus provides a partial alternative to the system recommended by the Milk Reorganisation Commission with regard to the functions of a Joint Milk Council. It was recently invoked for the fixation of milk prices in respect of the contract period ending 31st March, 1934.

Section 14 is an amendment of Sub-section (1) of Section 2 of the 1931 Act relating to the composition of marketing boards. Under Section 2 of the original Act, marketing boards are to be composed, until an election takes place, of the persons named in the scheme, together with two persons nominated by the Minister. Section 14 of the 1933 Act requires marketing boards to strengthen their membership by the co-optation, on and from the date of the first election, of two persons specially qualified by reason of commercial or financial ability.

Section 15 requires a board to appoint from among its members an executive committee of not more than seven persons. This committee is to discharge all the duties of the board except those specified in the scheme, and must include at least one of the members nominated by the Minister.

Sections 16 and 17 amend respectively the provisions of the principal Act as regards payment of compensation and as regards the effect of marketing schemes on contracts.

Section 18 enables, *inter alia,* a Reorganisation Commission to be appointed for the purpose of preparing a development scheme; it also brings development schemes within the purview of a committee of investigation.

Section 19 relates to the minor and consequential amendments specified in the Third Schedule.

Part IV. Miscellaneous and Supplementary Provisions.

The most important provision in this Part is Section 20, which makes void any contract for the sale of home-produced eggs in shell unless the eggs are sold by weight or under a grade designation prescribed in relation to eggs under the Agricultural Produce (Grading and Marking) Act, 1928. Petty sales (*i.e.* sales of less than 25 eggs) are exempted from this proviso, and contracts relating to eggs produced outside Great Britain or for delivery outside Great Britain are also excluded from the operation of the Section. The provision is intended to meet a generally expressed desire for legislation to encourage the sale of eggs by weight or statutory grade.

Section 21 enables the Board of Trade to obtain information as to stocks of primary or secondary agricultural products when the regulation of imports of such products is operative or in contemplation. Sections 22 and 23 relate to the payment by marketing boards of the expenses of Reorganisation Commissions, and other expenses incurred in connection with the promotion, submission or bringing into operation of schemes under either Act. Section 24 deals with the disclosure of information; Section 25 defines the position of directors and servants of a body corporate in relation to offences; Section 26 relates to the laying of Orders under the Act before Parliament; Section 27 is the usual routine provision regarding the exercise of powers by or on behalf of the Board of Trade; and Section 28 provides machinery for facilitating the co-operation of Northern Ireland for the purposes of the Act.

Of the three Schedules, the first deals with procedure in connection with the submission, approval, amendment and revocation of development schemes, the second with the constitution, incidental functions and winding-up of development boards, and the third with minor and consequential amendments of the 1931 Act.

Comprehensive and far-reaching though they are, it would be rash to assert that the Agricultural Marketing Acts of 1931 and 1933, as they stand at present, contain all the desiderata of effective marketing organization; indeed, it is fairly certain that further amending legislation will be required, from time to time, as experience is gained in the application of the marketing code to agricultural industries of widely varying structure and operating under widely varying conditions.

A short Bill, making further provision for the financial powers of marketing boards was, in fact, introduced into Parliament on November 28th, 1933, and may be expected to reach the Statute Book before the end of the year as the Agricultural Marketing (No. 2) Act, 1933.

A. W. Street.

Ministry of Agriculture and Fisheries,
London, S.W.

November, 1933.

GRASSLAND MANAGEMENT AND ITS INFLUENCE ON THE SWARD.

During recent years a common expression to be heard amongst farmers is " I have laid down all my land to grass ; some of it is satisfactory but some of the fields are not doing at all well."

The farmer is too often inclined to think that, once the seeds and the fertilizers are sown, then all has been done that can be done towards the production of a good sward. Great care is therefore taken in selecting suitable seeds, both in regard to species and strain, and an attempt is also made to ascertain the proper balance of fertilizers for the particular soil. The nature of the resulting sward is however determined by such agencies only for a comparatively short period of years.

It has to be remembered that if no seeds at all were sown by the farmer, the land would in time be clothed with a certain flora, and that it is only the effective competition of the sown species that serves to keep such natural plants in check. Moreover, there is continual competition between the various species that the farmer actually sows. What, then, determines the particular species, or group of species that shall predominate in the sward eventually ?

Certain facts about the behaviour of grasses and clovers—the most important constituents of our pastures—are well known ; other facts are less generally known ; whilst others, though they play a tremendous part in the development of pastures, are still unknown or only becoming known through recent research. What is more, the survival or the disappearance of the various species is often determined by the unconscious actions of the farmer himself. It is common knowledge that pasture plants tend to produce flower and seed during the summer months, and then reduce their leaf area before the winter, when they go through a semi-dormant stage—to waken up to renewed growth in the following spring. But the farmer rarely realizes that the various grasses or clovers do not waken up to active growth at the same time in spring. Still less does he realize that removing that first growth in the spring weakens the plant more than such a removal of growth at any other season. It is only in recent experiments that it has been shown that grazing, at one particular time in the spring, exerts a profound weakening influence on the species that happens to be in the most vulnerable stage at that particular time.

The *form of growth* plays an important part in influencing the selection by the animals, and hence in the strengthening or weakening of any particular species. Where there is no grazing, or the grazing is very lenient, plants of an erect-growing type have an advantage over their low-growing, prostrate associates. In competition the taller plants tend to smother out the lower ones or else cause them to upset their normal mode of growth—to waste energy in an effort to maintain themselves as, for example, when wild white clover produces long leaf stalks instead of the ordinary short ones.

On the other hand, when the grazing is such as to keep the pasture fairly short, the erect growing plants have to bear the brunt of the animal's attack because of the ease with which the grazing animal can lay hold of them. Further, such erect plants suffer the greater check from such close grazing, in that the animal may remove practically all their green leaves—the synthetic factory of the plant—which eventually have to be replaced by the plants at the expense of their body reserves in the root and base. In the meantime, whilst the factory is being rebuilt, there is a cessation of synthesis by such a plant—doubling its disadvantage in competition with the less affected plants. The prostrate-growing plants, on the other hand, do not expose themselves to such complete defoliation and so are not weakened to the same extent. At the same time these plants benefit by the more congenial surroundings resulting from the check to their competitors.

Palatability is another factor which contributes to the strengthening of one species at the expense of another. A plant varies in palatability with its stage of growth and with the rate of growth it is making at any given time—the younger it is, and the more rapid its leaf growth, the higher is its palatability. There is, however, a difference in palatability between the various species contributing to a sward, which difference is manifested to a lesser degree whilst the growth is young.

The grazing animal will therefore select the most palatable species, and even the most palatable part of the plant—the leaf—before it tackles the less palatable species or part. If circumstances happen to be such that there is plenty of green fodder available, the less palatable species may even be left untouched altogether (thus getting still less palatable) while the palatable ones are eaten down at each attempt to produce new growth. The result will be that the best plants—the most rapid growing and the most palatable—will be ousted by their competitors of low palatability, the sward thus coming to be dominated by what are usually designated "worthless or weed grasses".

The influence that the grazing animal may exert on the success (or otherwise) of any given species, in its struggle for survival in a sward, is therefore of paramount importance; the following experiments[1] were conducted at Jealott's Hill in order to ascertain to what degree, and how quickly, these changes could be brought about.

THE GRAZING OF A YOUNG CLOVERY SWARD.

On a young clovery sward, sown down two years previously with a comparatively simple mixture[2] of grasses and clover, four plots were fenced off and the grazing controlled as follows:—

Plot 1 was intended to become still more clovery and was therefore stocked heavily throughout the grazing season; particular attention being paid to keeping the herbage very closely grazed during the months of March, April and May. The result of this method of stocking was that the perennial ryegrass—the earliest species sown in the mixture—suffered during its critical period in the spring to such an extent that it was in a rather weak state throughout the rest of the growing season. The wild white clover on the other hand—a late species with creeping stems—suffered very little damage from the close grazing, and at the same time benefited from the reduction in the competitive influence of the grass. With such treatment the wild white clover, by the middle of the third season had, as shown in Chart 1, become the most important constituent of the sward. In fact the clover in Plot 1 had doubled, whilst the perennial ryegrass had been reduced to half what it was in the original sward.

Plot 2 on the contrary, which was intended to become more grassy, was not grazed at all before the middle of April, and from then onwards was never grazed very closely.

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[1] The experiments, the results of which are summarised in this paper, have been described in full in the Empire Journal of Experimental Agriculture:—Vol. 1, No. 1, April 1933; Vol. 1, No. 2, July 1933; Vol. 1, No. 3, Sept. 1933; Vol. 1, No. 4, Nov. 1933.

[2] The seeds mixture consisted of:—

Perennial ryegrass (Kentish indigenous)	24 lb. per acre.
Rough-stalked meadow grass	6 lb. „ „
Wild white clover (Kentish indigenous)	2 lb. „ „

Here the perennial ryegrass attained so vigorous a state in the spring that it did not suffer much from the subsequent grazing; and by the end of May, when the wild white clover was about to start its active growth, the ryegrass was already so fully occupying the sward that the wild white clover received a considerable check, and remained hampered throughout the rest of the season. Chart 1 again shows the extent to which, in Plot 2, the perennial ryegrass increased, while the clover was reduced to an almost negligible proportion.

Plot 3 was given an intermediate treatment. It was not grazed before the middle of April, but at each grazing it was completely bared down and then given a rest of about a month's duration. Here the perennial ryegrass benefited from the early spring rest, but the close grazing at monthly intervals later on allowed the wild white clover an opportunity to compete fairly successfully, with the result that the sward maintained a good balance between the grass and the clover. (See Plot 3 in Chart 1). Plot 3 further shows how, under a system of close grazing on a rotational basis with intervening periods of complete rest, the weeds are hampered in their competition with the rapid growing species of grasses, which grasses are, by the same token, the most palatable ones. This has recently been a well marked boon, many pastures badly infested with weeds having been cleared of them by adopting this method of grazing, aided often by the use of artificial manures.

Plot 4 was subjected to a method of grazing prevalent in many of our grassland areas, namely that of putting on a fixed stocking per acre regardless of the amount of growth produced at the various times of the year. In spite of the fact that the growth made in May and June would probably be somewhere about twenty times that made in January and February, the stocking per acre was not increased in the summer to more than double what it had been in the winter months. In effect this plot was subjected to overstocking in winter and early spring, followed by gross undergrazing during the summer and autumn, which undergrazing naturally brought about selective grazing. Such treatment has reduced the proportion of early grasses and, though it has conduced to the spread of wild white clover, it has at the same time allowed the least valuable, or quite worthless, grasses—bent and Yorkshire fog—to increase. Thus there has been a distinct deterioration in the botanical composition of the sward as a whole. (See Chart 1).

The progressive change in the sward of this plot, with its increasing content of weeds,[1] conforms closely to the deteriora-

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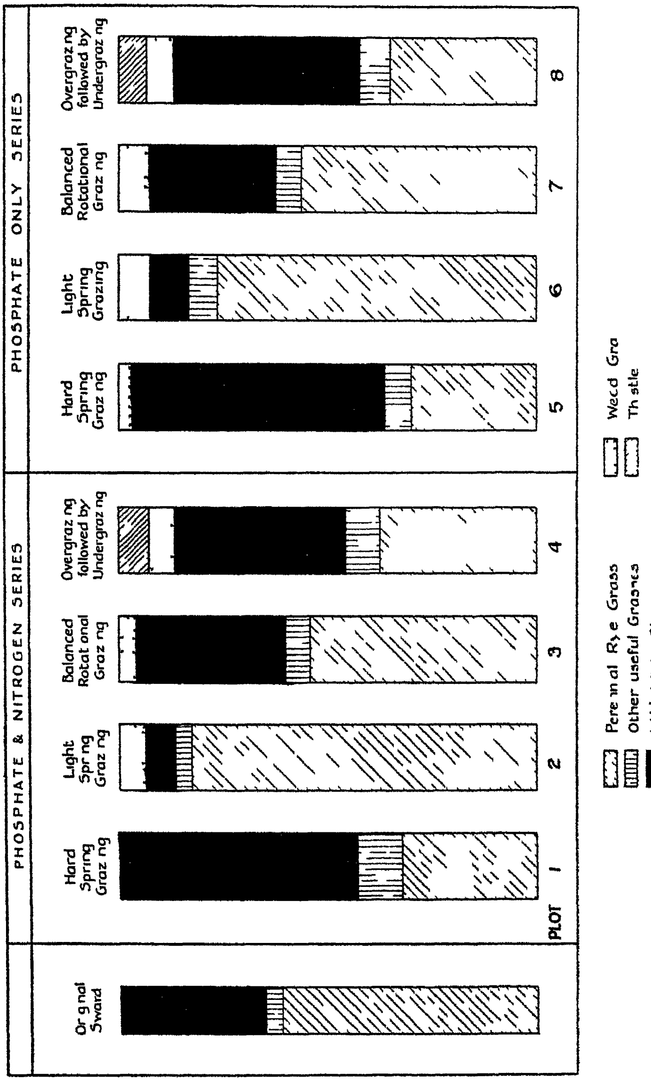
[1] The weed content of this plot would probably be increasing still more rapidly were it not for the short periodic rests given on account of the smallness of the individual plots.

CHART 1

SHOWING THE INFLUENCE OF THE METHOD OF GRAZING ON THE PERCENTAGE COMPOSITION OF A YOUNG CLOVERY SWARD AFTER THREE YEARS TREATMENT

JULY 1933



tion of grassland, so common all over the country, in its first few years after sowing. Especially does this deterioration occur where the land is subjected in winter and early spring, before the mountains and the so-called marshes are ready for stocking, to a heavy stocking of sheep. Indeed this phenomenon with regard to grassland has been so general and long standing that it has come to be regarded as " the normal progress of a sward on such poor land " and as an unavoidable evil ; the useful life—high production—of a sown sward often extending, under extreme conditions and with stemmy strains of low tillering capacity, to no more than three or four years.

The progress of the sward in the other three plots, with their quick response to the modified methods of stocking, stands in clear contrast, and shows that the method of stocking is an important factor in determining the botanical nature of a sward.

The above four plots had all received a dressing of phosphate at the commencement of the experiment—the equivalent of half a ton of basic slag—and a dressing of nitrogen, in the spring, at the rate of two cwt. nitro chalk in each of the years 1931,[1] 1932 and 1933.

In order to see what response (*i.e.*, botanical changes) would be made to each of the four methods of management under a different scheme of manuring, four plots (Nos. 5–8), on an adjoining area of the same sward, were fenced in at the same time, but the nitrogenous dressings were withheld. The *yield* of pasture was considerably reduced by the withholding of the nitrogen, particularly in the spring, when growth was reduced to about half. The *relative proportions* of the species, however, as shown in Chart 1, remained practically identical for each method of grazing, whether the nitrogenous manure was added or not.

THE GRAZING OF AN OLD PERMANENT SWARD.

In order to see whether a different type of pasture—an old established permanent sward—would respond, comparably with the more recently established sward described above, to variations in management of the grazing, an experiment on the same lines was laid out on a very old permanent pasture typical of the district. This sward consisted chiefly of bent grass together with a fair proportion of Yorkshire fog and fine-leaved fescue ; whilst clover and the better grasses figured but to a very slight extent. A series of eight plots were treated in a corresponding manner both in regard to manuring and grazing.

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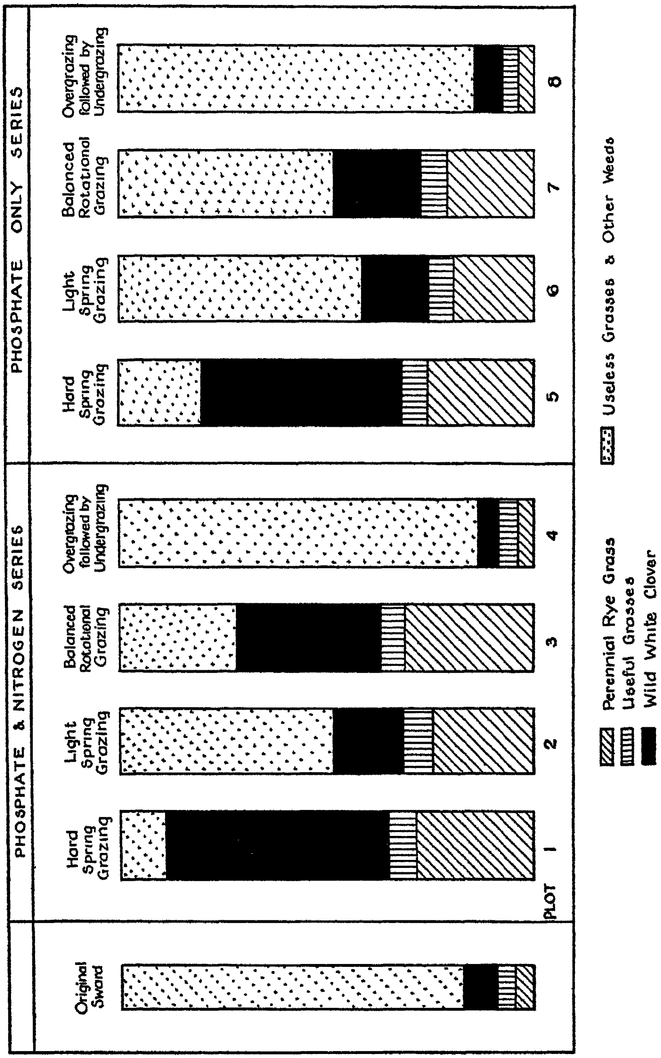
[1] In 1931 the nitrogenous dressing was given in two halves—the first in March and the second in June.

CHART II.

SHOWING THE INFLUENCE OF THE METHOD OF GRAZING ON THE PERCENTAGE COMPOSITION OF AN OLD PERMANENT SWARD AFTER TWO YEARS' TREATMENT

JULY 1933



As is shown in Chart II, the close grazing of Plots 1 and 5 resulted in a most remarkable decrease in the weed content (including useless grasses) both in the nitrogen and the no-nitrogen series, the weeds being replaced mostly by wild white clover and to a less extent by perennial ryegrass.

Plots 2 and 6, with their light grazing in the spring, also showed a reduction in the weed content though this was not quite so marked. In this case, however, the suppression of the weeds was due in part to the increased vigour of the early species (ryegrass), and under these conditions the ryegrass played, relatively to the clover, a greater part in weed suppression.

The rotational grazing (Plots 3 and 7) caused an appreciable reduction in the unpalatable weed grasses and a big increase in the perennial ryegrass. With regard to their content of perennial ryegrass and of wild white clover, the rotationally grazed plots attained an intermediate position between the plots subjected to " very heavy grazing " (Plots 1 and 5) and those of the " light grazing particularly in the spring " (Plots 2 and 6).

Plots 4 and 8, with their overgrazing in the spring and undergrazing in the summer and autumn—the usual treatment given the field in previous years—remained very much the same, botanically, as the original field.

As in the case of the young sward there was agreement of a very high order, with respect to changes in botanical composition, between the respective plots under the nitrogen and no-nitrogen treatments ; the total yield was, however, greatly augmented by the nitrogenous manuring.

The striking feature of this experiment has been the extreme rapidity with which the sward has changed under the influence of the grazing animal, and that despite the fact that the sward had remained for such a long time previously in stable equilibrium—showing that even old pastures, which have long attained a point of equilibrium with their environment, can soon be changed by altering the system of grazing. The rapidity with which the wild white clover and the perennial ryegrass increased on this land, which would ordinarily be regarded as naturally inclined towards bent grass (and indeed consisted of so much bent, fog and the fine-leaved fescue grasses, together with buttercups, as to be unpalatable and hence avoided by stock as much as possible) would suggest that, in order to improve swards of this type, it would be more economical to invest the available capital, not on ploughing out, cultivating and seeding, but in such a way as to enable the stocking, and its timing, to be adjusted for a year or two in such a way as to give paramount consideration to the benefit of the sward.

THE GRAZING OF A YOUNG GRASSY SWARD.

In a third experiment differences in management were used to differentiate not only between the clover and grass, but also between more closely allied species such as perennial ryegrass and cocksfoot. For this purpose another young sward, containing very little clover but with a fair mixture of ryegrass and cocksfoot, was utilized.

As ryegrass was found to commence "active growth" at an earlier date in the season than cocksfoot, and since each species was found to be highly susceptible to the weakening effect of defoliation at that critical time, the ryegrass-designate plot was *rested* from stock for the earlier part of the critical time, to strengthen the ryegrass, and afterwards grazed fairly hard when the cocksfoot would be starting active growth. On the other hand, the cocksfoot-designate plot was *grazed* during the earlier part to weaken the ryegrass and then rested in order to allow the cocksfoot to strengthen itself. This experiment was conducted on very much the same lines as the two previously described, with the difference that, in order to encourage the ryegrass at the expense of the cocksfoot, Plot 2 was rested throughout the whole of March and the first half of April when the ryegrass was making its initial growth; while from the middle of April onwards it was grazed, thus removing the first actively growing blades of cocksfoot as soon as they appeared. On the contrary Plot 3 was grazed during March and the first half of April so as to check the perennial ryegrass, but from the middle of April till the middle of May, when cocksfoot was making its active growth, the plot was kept free from stock. The result was that, by the third season, (see Chart III) the cocksfoot had attained almost complete supremacy, both under the nitrogen and phosphate treatment and under phosphatic manuring alone.

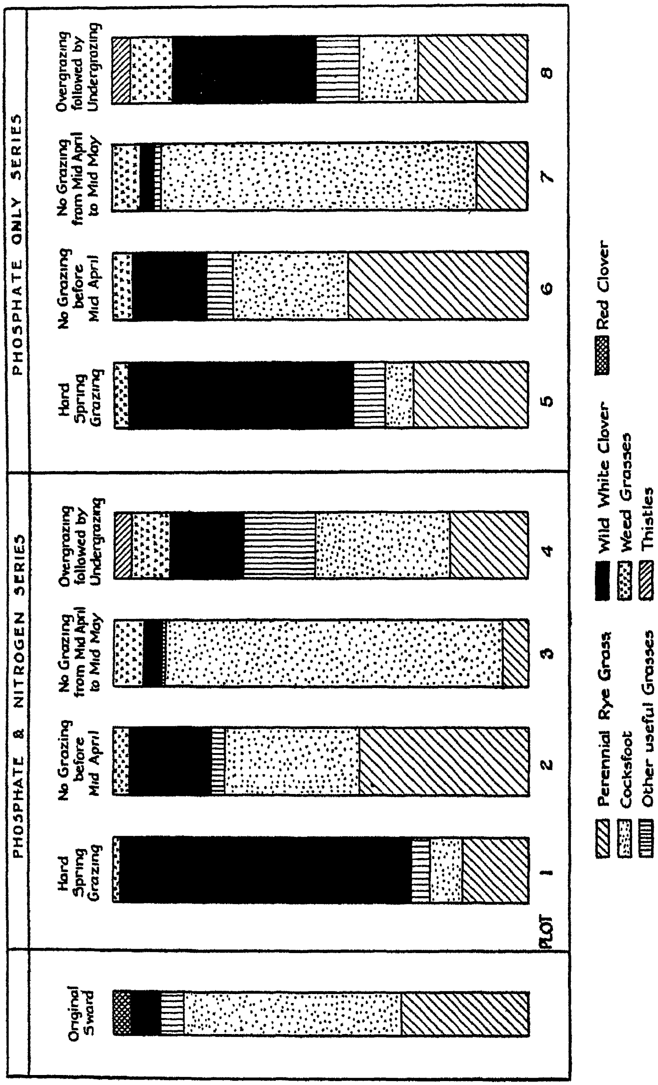
Plots 1 and 5 showed too that a sward which had been almost devoid of clover at the commencement of the experiment could be converted, in two seasons, into a clover-dominant sward by suitable management of the grazing. Indeed these plots showed that the method of stocking might have a greater influence on the botanical composition of the sward than even the composition of original seeds mixture.

A statistician might criticise these experiments on account of the lack of replication of the individual plots. The differences between the plots receiving the various grazing treatments were, however, very great, and moreover, they persisted right up to the boundaries of the plots; hence when the three experiments are taken together, and the agreement between the two halves of each experiment (the nitrogen and no-nitrogen

CHART III.

SHOWING THE INFLUENCE OF THE METHOD OF GRAZING ON THE PERCENTAGE COMPOSITION OF A YOUNG GRASSY SWARD AFTER THREE YEARS TREATMENT

JULY 1933



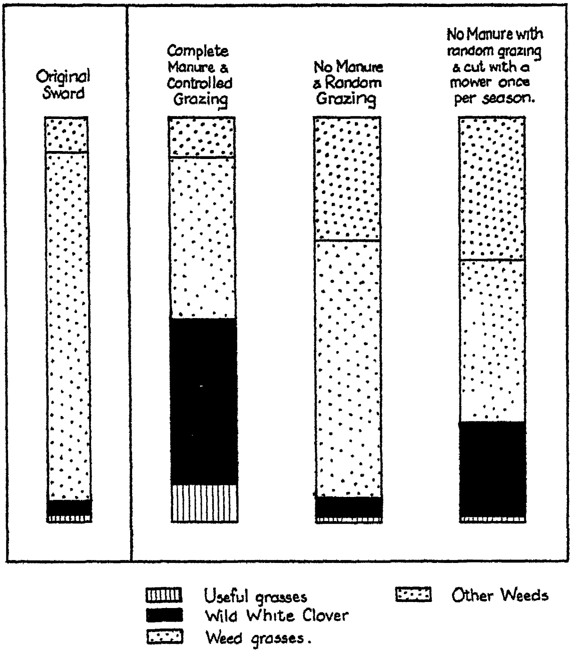
series) is considered, there can be no doubt about the significance of the results.

THE GRAZING OF A "TUMBLE-DOWN" PASTURE.

Vast tracts of land, particularly in the post-war period, have been abandoned by the plough and left to seed on their own, and much of this land has been regarded as incapable of establishing good grasses. These facts prompted an experiment on the management of "tumble-down" land.

Such a sward, consisting primarily of Yorkshire fog and crowsfoot, was subjected to controlled grazing along with complete manuring—the addition of phosphates, potash and nitrogen. An adjoining area of the same sward was kept for comparison—no manure being applied and the grazing done only at random, mostly when pasture was scarce. A portion of this latter area was, in addition, cut with a mower once each year in June.

CHART IV
SHOWING THE INFLUENCE OF METHOD OF GRAZING TOGETHER WITH MANURING ON THE BOTANICAL COMPOSITION OF A "TUMBLE-DOWN" SWARD AFTER TWO YEARS' TREATMENT
JULY 1933



On the controlled-grazing area, sheep were penned at each period of the year in proportion to the pasture available, particularly during the months of April, May and June. It was thus hoped to prevent, as much as possible, the seeding of the weeds, to keep the weed grasses fairly closely grazed, to maintain the sward in a more palatable condition and allow the prostrate wild white clover to spread.

The changes brought about in this sward in two years are shown in Chart IV. The manuring so improved the palatability of the herbage that it was not long into the first season before the sheep had got the major portion of the weed grasses under control; this eventually allowed the wild white clover to spread, followed in the subsequent year by the inroad of a fair percentage of useful grasses, primarily rough-stalked meadow grass. On the area where no manure was sown the grazing at random allowed the herbage to get so high, in summer that such traces of wild white clover and useful grasses as were present were kept in check, and only the tall-growing weeds were allowed to increase. Where the mower had been utilised on this plot there was a distinct improvement in the spread of wild white clover, but so far even this portion lacks, to a marked extent, that vigorous growth of useful grasses so desirable in pasture management.

THE AUTUMN TREATMENT OF PASTURES.

The foregoing experiments dealt, in the main, with differences in the management of pastures in the early part of the season. Differences just as important can be produced by varying the management during the latter part of the season—in the autumn.

An experiment was designed to compare the effects of early autumn protection[1] as against late autumn protection, under conditions of high manuring and of no manuring, starting with a young grassy sward in which both perennial ryegrass and cocksfoot were fairly prominent (see Chart V).

For the early autumn protection two plots (1 and 2) were closed in on July 20 and given a month's complete rest before the next grazing, this being followed by a long rest until the beginning of November, when another grazing was taken. For late autumn protection, two other plots (3 and 4) alongside were grazed continuously and heavily until early September, and thereafter given a month's rest before their final autumn grazing. The grazing on each occasion was done by sheep, a sufficient number being put into Plot 1 to eat the grass down in two days. During the following two days these sheep were turned into Plot 2, for short periods, to do the necessary grazing but returned into Plot 1 for their rest periods during which were passed practically all their urine and fæces. Such control of the stock resulted in Plot 1 receiving almost double the usual animal excrement, while Plot 2 was deprived of its quota.[1] Plots 3 and 4, when grazed, were treated as a pair of plots on which the animals' grazing and resting periods corresponded with those for Plots 1 and 2 respectively, so that Plot 3 received the extra droppings of which Plot 4 was robbed.

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[1] Protection is here used to indicate *lenient* grazing under careful control as contrasted with frequent hard grazing.

The effect on the yields produced by the differential manuring obtained by such a manipulation of the grazing was such that the plots receiving the extra droppings made practically double the growth of the others. The influence on the botanical composition of each sward was of still greater significance. The plots yielding the most produce (Plots 1 and 3) had by far the least clover, whilst the others, with their weak growth, showed a decided increase in clover content (see Chart V).

The timing of the autumn protection also showed an effect on yield—the greater and the earlier the protection in the autumn the bigger the yield during the following season. The chief effect, however, was the changed balance between the botanical elements in the sward. In the plots receiving droppings the early protection produced a cocksfoot-dominant sward whereas the late protection produced a ryegrass-dominant sward. Their counter plots without droppings produced in the one case a high proportion of red clover[2] (with protection in early autumn) and in the other (with late autumn protection) a definite dominance of wild white clover (see Chart V).

These responses of the sward may be explained when the characteristics of the various species are considered. Both cocksfoot and ryegrass benefit from a period of protection from grazing after the flowering stage is passed. This respite they use to store up reserves, mostly in their basal parts and roots. During the early autumn cocksfoot grows more rapidly than ryegrass ; hence it derived greater benefit when protected from grazing at that time, and conversely suffered more where not protected. On the other hand the ryegrass was still growing during the late autumn whereas the cocksfoot had already

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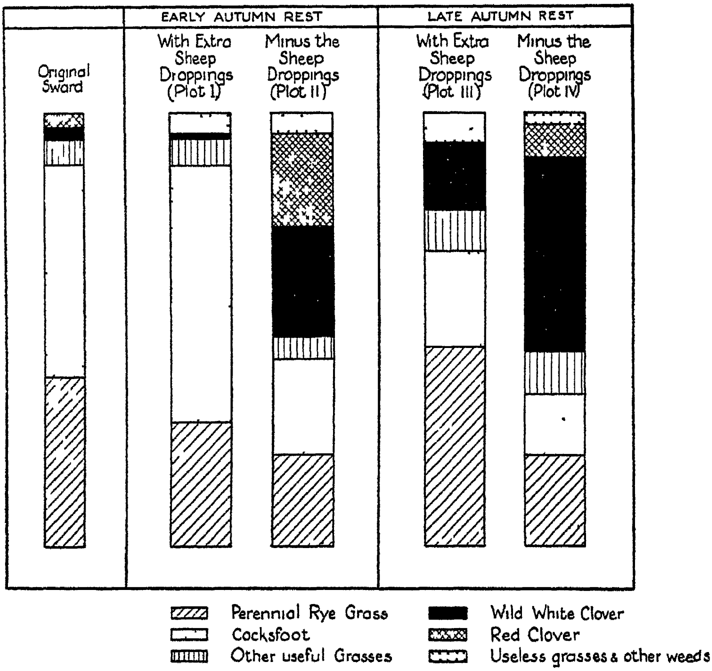
[1] Differential return of animal droppings is a common feature of the night paddock system near the farm buildings for the dairy herd. The cows tend to void on the night paddock more droppings than are commensurate with the pasture taken off it, thus carrying over from the distant 'day grazing' field a certain proportion of the manurial return.

[2] This is the more remarkable as the seed had been sown three years previously and even this strain of red clover (Montgomery red clover) generally dies out after two years under the usual conditions in the East of England.

CHART V

SHOWING THE INFLUENCE OF THE TIME OF AUTUMN RESTING AND MANURING UPON THE BOTANICAL COMPOSITION OF A YOUNG SWARD AFTER ONE YEARS' TREATMENT

JULY 1932



" gone into winter quarters ". Thus the protection from grazing was of more benefit to the ryegrass.

With regard to the clovers, both the red and the white species benefited, where the manurial ingredients had been withheld, from the reduced competition of the grasses, thus showing that the success or otherwise of these leguminous plants is largely a question of such competition. The manurial ingredients themselves (fæces and urine) are not likely to have had much adverse effect on the wild white clover since, in adjoining areas in the same field, the wild white clover seemed to thrive better the more of such ingredients it received—provided that the competing grasses were kept in check by close grazing.

Red clover and the wild white clover stand in very much the same relation as cocksfoot and ryegrass, the red clover growing more rapidly than the white during the early autumn and therefore benefiting from protection at that time and suffering more where subjected to frequent hard grazing at that time. When, however, the rest given is too late for the red clover to benefit so much, then the white clover will, in the following season, have very little competition from the more erect growing red clover, or from the erect grasses. The results of this experiment, together with those of the foregoing one, on the influence of grazing at the beginning of the season, explain why perennial ryegrass and wild white clover are so often found in association, whilst red clover is more often found with grasses such as cocksfoot and timothy

Each of these two methods of autumn treatment has its counterpart in practical farming In the one case the practice of carting farmyard manure on to the land immediately after the hay is removed gives cocksfoot the necessary protection from the grazing animal and also the extra plant food during its period of active growth in the autumn, with the result that hay fields so treated soon become dominated by this tall-growing grass. On the contrary pasture fields subjected over a number of years to hard grazing throughout the summer and early autumn, and then saved for a February bite, usually contain far more ryegrass than cocksfoot.

THE RELATION OF A SWARD TO THE SEEDS MIXTURE.

So profound is the influence of the grazing animal on the eventual condition of the sward that it very largely controls the progress of any constituent in relation to its competitors and far outweighs the influence of the rate of seeding of particular species.

The small influence of the seed sown, on the sward after four years, has been brought out in an experiment where four typical species of herbage plants—perennial ryegrass, rough-stalked meadow grass, crested dogstail and wild white clover—were sown, each as a pure-culture plot, alongside a mixture consisting of approximately equal numbers of viable seeds of the four species. The seeds were sown under a barley crop in the spring of 1929, and the plots have been grazed with cattle and sheep each year since, no hay crop having been taken. The plots have always been unstocked during the winter and early spring, whilst the number of animals per acre has always been heavy in May and June.

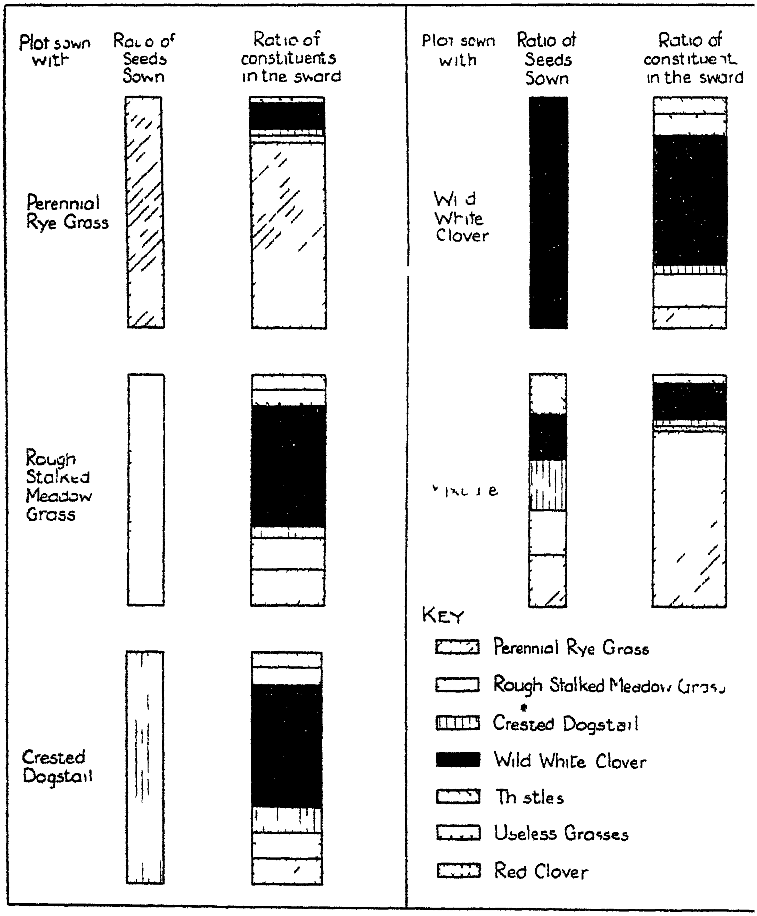
The botanical analysis of each plot in the fourth year is shown alongside the original seeding in Chart VI. In the pure-seeding plots no single species—not even the most suitable species—was able to prevent other plants from invading the sward. In the plots sown with pure seedings of the grasses, the chief " volunteer " plant was wild white clover, illustrating

CHART VI

SHOWING THE PERCENTAGE CONTRIBUTION OF EACH SPECIES TO THE SWARD
FOUR YEARS AFTER SOWING

(a) When sown alone. (b) When sown in a mixture

JULY 1933



the high colonising power of this plant wherever the environmental conditions are suitable Nevertheless where wild white clover had been sown alone it did not prevent the entry of an appreciable quantity of grasses. Of those " volunteer " grasses the majority were useful ones, but weed grasses constituted quite an appreciable proportion of the invaders.

When the three grass species, sown individually, are compared together, the subordinate position occupied by the " bottom grasses "—rough-stalked meadow grass and crested dogstail—stands out in clear contrast with the prominence of the perennial ryegrass in its own sward, thus indicating which of the three species fits in best with the environmental conditions, including the biotic element—the grazing animal.

The relative development of the four constituents when sown together illustrates the inability of any constituent to maintain its position in a sward when placed in competition with other plants which have the advantage over it. Here the three grasses were sown at the same rate of viable seeds, yet their contribution at the end of four years is by no means proportionate to that seeding. On the contrary the composition of the sward from the mixture of seeds is practically identical with that obtained where only the dominant species—perennial ryegrass—was sown. This gives further emphasis to the needs, firstly of simplifying seeds mixtures so that they may contain but the minimum number of species, selected with due regard to the competition of one species with the other ; and secondly of so controlling the grazing as to encourage those particular plants at the critical times of the year.

Once the grazier has realized the importance of such management in relation to the constitution of his sward, it will not be long before he will appreciate, more fully than at present, the extreme importance which strain plays in relation to the production of keep at critical times, and to the nutritive value—leafiness—of pasture plants

The grazing factor ultimately decides whether even the major species sown in a mixture shall remain in the sward. In the past, however, the method of grazing particular fields has generally been reduced to a somewhat rigid system, the routine depending on the nature of the soil and climate and the economic objects in view. The persistence of the various species and strains has therefore in fact been tested under a variety of such systems. As a result pasture plants have generally been classified according to their suitability to the particular soil and climate. No attempt has been made to reverse the process—to find out which particular species or strain is most suitable for any given economic purpose on that farm, and then to mete out to the newly sown sward such carefully considered control as would cause that useful plant to survive, and possibly to dominate, in the sward.

* * * * * *

It might be objected that, since the results here recorded have been obtained only under the local conditions of soil and climate obtaining at Jealott's Hill, the conclusions drawn from them may not legitimately be applied to grassland in other districts. This is a cogent objection : similar experiments must be carried out in other districts before final conclusions can be drawn and the full interplay of biotic, climatic and cultural factors can be worked out.

But the final test of the value of these results is to be sought in their application to grazing practice. Fortunately a study of pastures typical of strongly contrasted methods of practical grazing management, in different parts of the country, can easily be made. This provides a test of the validity of the reasoning used in the design and interpretation of these experiments, and at the same time indicates the wide range of practical conditions of pasture management to which the principles enumerated here may be applied.

Bearing on the relation of certain pasture types to the use made of them, let us take the grazings of Romney Marsh, which stands out among the pastoral districts of the whole world. In these marshes there are different grades of pasture, some being four times the value of others ; yet the fields which so differ in value lie intermingled, being separated merely by narrow water courses. When observed more closely, however, some grouping of the fields according to their merit does show up. The differences frequently follow the artificial divisions of the land, the boundaries of the pasture types coinciding with those of the holdings.

In the best fields the sward is composed to the extent of ninety per cent. of two species, wild white clover and perennial ryegrass. Fields of the middle class have less of these two species, their place being taken by barley grass, golden oat grass, rough-stalked meadow grass and crested dogstail, together with a small amount of Agrostis. The swards of the poorest fields, however, often have less than ten per cent. of the two species which are always associated in the area (perennial ryegrass and wild white clover) and the chief constituent of the sward is Agrostis.

What is the difference in the management of the best and the worst fields ? On the best the practice has been, for years, to fatten two-year-old sheep during the winter months, whilst in the summer the chief aim of the farmer has been to keep the pastures from throwing up any stems. So anxious are the best farmers to prevent any stem formation that they will stock, during May, June and July, as heavily as fourteen sheep to the acre with the addition of a three-year-old Sussex beast to every four or five acres. This rate of stocking, of course, has in the past prevented lambs, dropped in the spring, from attaining in that summer anything better than store condition. It has also been responsible, in large measure, for the popularity of the slow-growing Sussex breed of cattle. Though closely grazed in the summer, these pastures are not allowed to start the winter in bare condition. On the contrary, they are almost completely cleared of stock at the beginning of September, so that they may provide a bite for the winter-fattening tegs. The latter are ultimately drawn upon for the fat market during the months of January to April. The stocking with this class of sheep is at the rate of only one to the acre at the commencement of the winter, and as marketing proceeds the stocking becomes almost negligible by March or the beginning of April. In the spring the ewes and lambs, which have been wintered away on the higher ground, do not return to their summer quarters until there is a fair cover of grass on the ground.

The result of this method of management is to check all the grasses during the summer months and thus encourage the wild white clover, whilst in the autumn and early spring the grass with the longest growing season—perennial ryegrass—becomes the chief grass constituent.

The management of the poorer fields, on the other hand, is usually governed by the wish to carry as many sheep as possible on the marsh during the winter months so as to save the charges for winter keep elsewhere ; and the tendency is to have the pastures understocked during summer. Under such treatment the grasses which start earliest in the spring are subjected, at that critical period in their life cycle, to severe defoliation at frequent intervals—and that at a time when it is difficult for them, on account of weather conditions, to recuperate. Later in the season, when the temperature conditions become more favourable for growth, all the plants present compete for space and plant food. During this struggle the palatable perennial ryegrass suffers in two ways : It is in a weak state after the early grazing : and also it is selected by the sheep, out of the abundant growth, in preference to its less palatable competitors such as bent grass and the fine-leaved fescues. The unpalatable grasses are therefore able to increase their hold from year to year until eventually the sward is almost depleted of perennial ryegrass. At the same time the matted growth of the worthless grasses causes the disappearance of the prostrate and nutritious wild white clover.

The pastures of the Midlands are also famous. The Midland grazier, however, is noted as a feeder whose aim is to fatten every beast, off the grass, before winter. In order to do this he purposely refrains from stocking so heavily, at any time during the summer, as the Romney Marsh man. Especially is the stocking lighter in July and August when the animals are getting towards the fat stage. This treatment, by allowing the grasses always to hold their own, tends to keep the clovers somewhat in check and in wet years of abundant growth a fair amount of selective grazing is done ; this results in an increase of the unpalatable Agrostis species (bent). In the spring, too, the Midland grazier usually refrains from turning stock into the better pastures until he feels assured that there will be enough growth to carry the animals right through to the fat stage. This practice gives the pasture a good start in the spring, and hence encourages the earliest species—perennial ryegrass.

In parts of Northumberland which are now gaining a reputation for their wild white clover pastures, a different system is adopted by the graziers, the cattle being carried over the winter. This system enables the feeder to take advantage of the cheaper market for store cattle in June and July instead of paying the higher prices earlier in the spring. The cattle reach a half-fat condition by the autumn and are then held over the winter, without cake, ready to be finished off in a short period on grass at the beginning of the next grazing season. They are commonly fat by June or July when grass fed beef is at its highest. Under this system of management the newer swards (which have been seeded down from ten to fifteen years ago) are looked upon as the feeding pastures, and as such are given complete rest during the winter months and the early spring. They are then ready to produce the maximum of live weight increment during the more favourable period of the year. When these feeding pastures are closed up, about the end of September, the stock is generally run on the old permanent grassland for about two months. Again in the spring, for about a month before the feeding pastures are ready for stocking, the cattle are run over the old permanent grassland.

The effect of this system on the pastures is that the feeding pastures are stocked to their full capacity during the period of maximum growth ; and since the fat cattle are sold off during the course of June and July and replaced by the less fastidious store cattle, the grasses are never allowed to grow high and check the clover. This replacing of fat cattle by stores as the season advances has been responsible for maintaining the high clover content in the pastures of these districts as contrasted with the more grassy pastures of the Midlands. Resting in winter and early spring has made ryegrass the dominant species among the grasses.

The old permanent grassland on the contrary has usually been understocked during the periods of maximum growth, or else it has been allowed to produce a hay crop and the aftermath has been left for consumption during the autumn, after the feeding pastures are closed. The effect of such treatment has been to convert these old permanent grasslands into almost pure cocksfoot swards. Ryegrass and white clover are conspicuous by their absence, though adjoining fields of similar soil, aspect and altitude may be dominated by them.

In the absence of special experiments, similar to those here described, in these various districts it would not be justifiable to dogmatize. Nevertheless the fact remains that, whether or not they *must* be so explained, the differences in the nature of the various main pasture types of the country *can* be satisfactorily explained as resulting primarily from the method of grazing management adopted ; and it is suggested that this factor, more than any other, is responsible for the differences in botanical composition.

It goes without saying that management of grazing must not be adduced to account for pasture conditions which are in fact due to such conditions as waterlogging, high soil acidity, or extreme poverty of soil. The remedying of such conditions is a prerequisite for the obtaining of a good pasture anywhere. But assuming that this has been done—that the soil is adequately drained and limed, and that it is kept at a satisfactory level of fertility—then it lies in the farmer's own hands largely to determine the character of his pasture by the method of management of his grazing. Within wide limits, differences of soil, climate and manurial treatment are of quite secondary importance, and should never be adduced to account for the condition of a pasture unless and until it is found that it cannot be explained by a consideration of the grazing management throughout the year.

To sum up : There is more than one species in every pasture ; these species grow in competition with one another ; and it is largely within the power of the farmer, by appropriate management of the grazing, to decide which shall predominate and which shall be suppressed.

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FACTORS AFFECTING SOME TYPES OF FARMING IN DEVON AND CORNWALL.

Attempts to apply generalizations on farming practices to actual farms often fail because the principles on which they depend need special interpretation when applied to conditions on individual holdings. But while lack of complete uniformity is characteristic of the agriculture of any area, there are generally broad features of resemblance in the farming of a district which distinguish it from farming in most other districts. Thus parts of Lincolnshire are noted for potato farming, Cheshire is famous for its dairying, and the grass of parts of Leicestershire, Northamptonshire and Warwickshire makes this district second to none as a grazing area.

This division into, or specialization of, farming types is not fortuitous. It can generally be traced to natural or economic causes, of which the most important are soil, climate, topography, markets (including market demand, and proximity, etc., to markets), and the relation of the type to other competing types in the region. There are other factors,[1] but they are usually of less importance than the foregoing.

In many parts of the world the systems of farming are more clearly defined than they are in this country, and the reasons for their variations can usually be determined without difficulty.

This is true of many of the central and middle western regions of the U.S.A., to such an extent that research workers in farm management problems often feel justified in extending the boundaries where the conclusions of their investigation apply beyond the area investigated. Thus, a survey which may have been conducted in one county of a state may be used to provide data which are applicable in whole to one third of the entire state, and in part to a further third.[2].

In this country, the divisions are not so clear cut, and the reasons for them are less obvious because it is seldom that one type of farming extends throughout even one county, and the study of the reasons for the various types tends to be complicated on this account.

The importance of the study of the various natural and economic factors on systems of fàrming is being increasingly recognized and it is suggested that " we need a national survey of the systems of farming in relation to such local factors as climate, soil, topography, and market demands."[1]

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[1] Cf. for example, Warren, G. F. "Farm Management," p. 43, 1918.

[2] Cf. for example, Long, Lewis E., and Kifer, R. S. "Systems of Farming for the Hill Section of Mississippi." Mississippi Agr. Experiment Station Bulletin No. 257, and Case, H. C. M., et al. "Organising the Corn Belt Farm for Profitable Production," University of Illinois Agricultural Experiment Station, Bulletin No. 329.

An American opinion of the value of studying types of farming areas is that such a project " gives a bird's-eye view of the field and provides a background of information essential to a correct understanding and interpretation of the economic problems of the farmer. It furthermore affords the researcher a means of orienting himself in the agricultural problems of his state or region and of studying them in their local setting."[2]

Data on which such a study can be based are available in the " Agricultural Statistics " which are compiled from the June 4th returns furnished by farmers to the Ministry of Agriculture, and in the Agricultural Atlas of England and Wales, a new edition of which has recently been published. The weakness of using the former source of information for comparing farming systems is that the divisions are county divisions, and, as already indicated, it is seldom that one type of farming persists throughout a county. Thus the value of figures which show the average cropping and stocking per acre in a county which has more than one system of farming is usually vitiated by the fact that the " average " applies to no actual system. For instance, " a comparison of the agriculture of Devon with that of England and Wales indicates that, for the more important crops and classes of livestock, the type of farming exhibits, in general, a considerable amount of similarity."[3] But Devon is a county which has a larger variety of systems than most counties, and, as is shown in the illustrations which accompany this article, to apply the average figures for Devon to any part of Devon would generally be totally inappropriate.

The " Agricultural Atlas " surmounts the difficulty of the county boundaries by basing its figures on the parish statistics. The present study, confined to the counties of Devon and Cornwall, also relies on the parish statistics for its information, and, like the latest issue of the " Agricultural Atlas," the statistics refer to the 1928 June 4th returns, which have been supplied to the writer through the courtesy of the Statistics Branch of the Ministry of Agriculture. In order not to contravene the provisions of the Agricultural Returns Act, 1925, which pledges anonymity of all individual records obtained from farmers under the Act, the parish statistics have been taken in groups of at least ten parishes each.

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[1] Astor, Viscount, and Murray, K. A. H. " Land and Life," p. 151, 1932.

[2] " Research in Farm Management." Social Science Research Council, Bulletin No. 13, p. 31, June 1932.

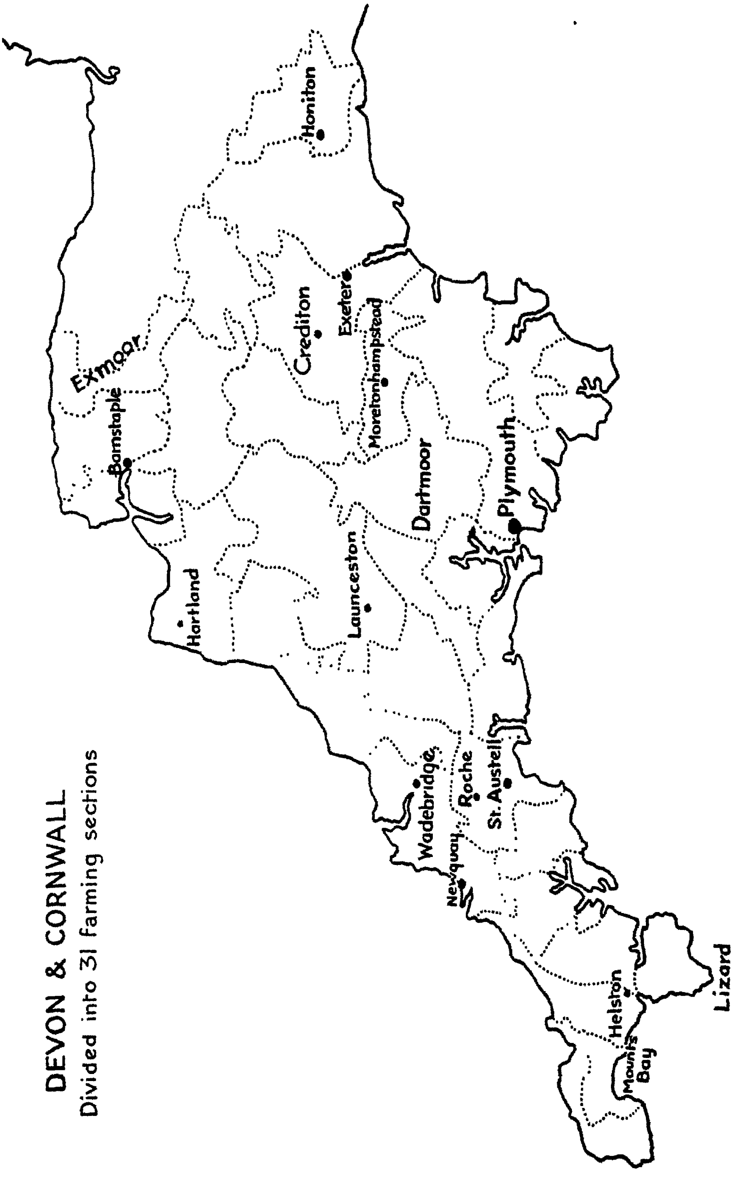
[3] Currie, J. R., and Long, W. H. " An Agricultural Survey in South Devon," p. 8, 1929.

In all, 31 groups have been made which include all the parishes in the two counties. The basis of grouping of the parishes has been the type of farming most popular in each area. Thus in West Cornwall, where dairy farming and pig-keeping is the outstanding type, the grouping has been based on differences in the intensity in the stocking of dairy cows and pigs. In that part of Mid-Devon where potatoes are particularly important, the basis has been the acreage of potatoes grown per 1,000 acres of crops and grass. This method may be open to the objection that it tends to over-emphasize the predominant type of farming, but, at any rate where the tendency rather than the actual numbers is of prime importance, it is a method which appears to be satisfactory.

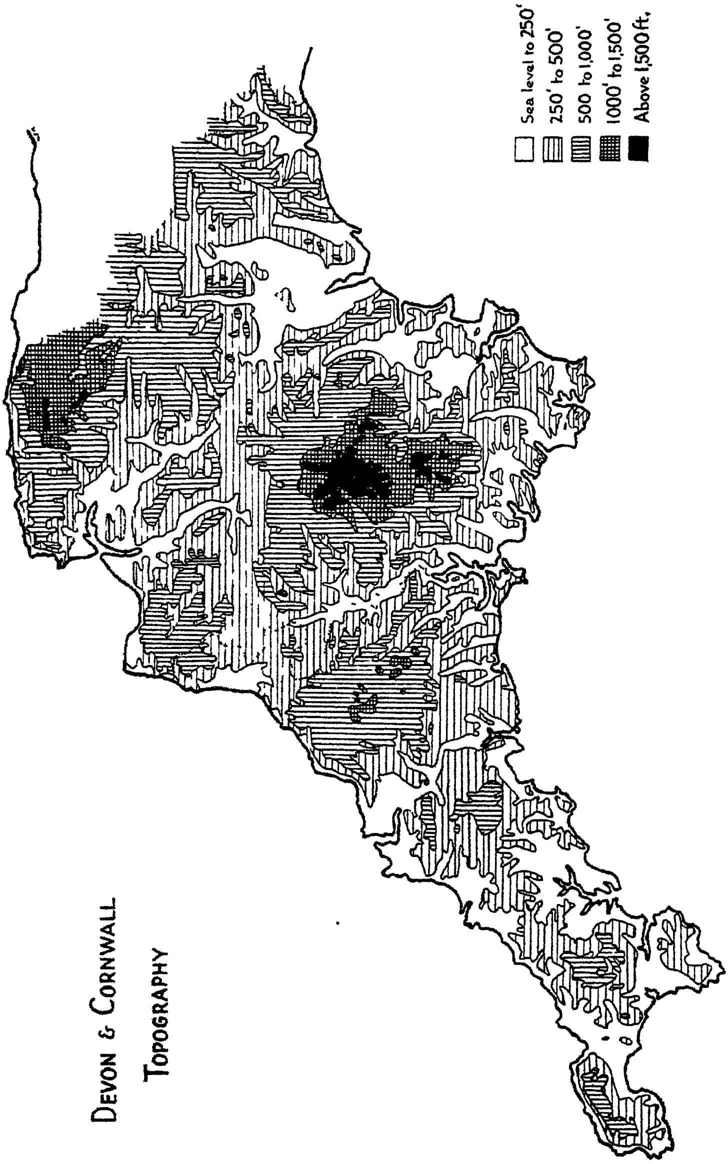
The comparative importance of some of the main crops and types of livestock is indicated on the maps which follow. They are not exhaustive, but have been selected because they illustrate clearly the effect which the combination of natural and economic conditions has had in determining the types of farming practised in the various districts in these two counties of the South West.

Map 1 indicates the 31 areas into which Devon and Cornwall have been divided for the purposes of this study. A few of the more important towns are inserted as landmarks. The topography is indicated in Map 2, while Map 3 shows the rainfall. The rainfall map has been based on the average rainfall for the 35 years 1881 to 1915, as reported by the Meteorological Office. The similarity between Maps 2 and 3 is remarkable. The altitude of a district has a very marked effect on the rainfall. To make the information concerning natural features complete, a soils map should be inserted. Unfortunately, however, no map is available which would give this information satisfactorily. A geological map often fails to indicate the agricultural soils of an area owing to drift, and, although Devon and Cornwall have not been subjected to glacial drift, washings of soil from the hills have often superimposed a soil on the underlying rock which would make unreliable deductions drawn from the geological map.

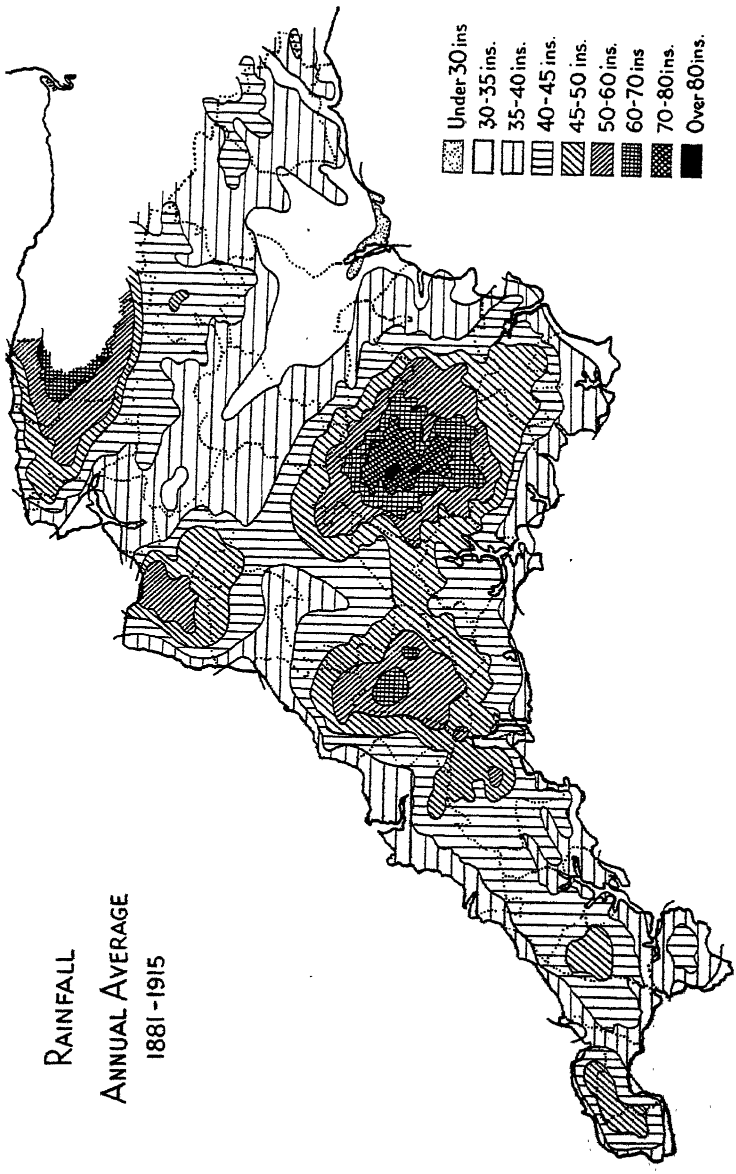
Tillage. (Map 4). There are three main tillage areas in Devon and Cornwall, (1) in Mid-Devon, around Exeter, Crediton, etc., (2) in the southern part of South Devon, (3) in Mid-Cornwall. There are, too, isolated areas in the Hartland district, and between Helston and the Lizard, and round Mount's Bay. The chief features which most of these districts have in common are that the rainfall is comparatively low (not more than 40 in. in most parts), topography is fairly level, and the land is fairly


DEVON & CORNWALL
Divided into 31 farming sections
Exmoor
Barnstaple
Hartland
Honiton
Crediton
Exeter
Moretonhampstead
Dartmoor
Launceston
Plymouth
Wadebridge
Roche
St. Austell
Newquay
Helston
Mounts Bay
Lizard

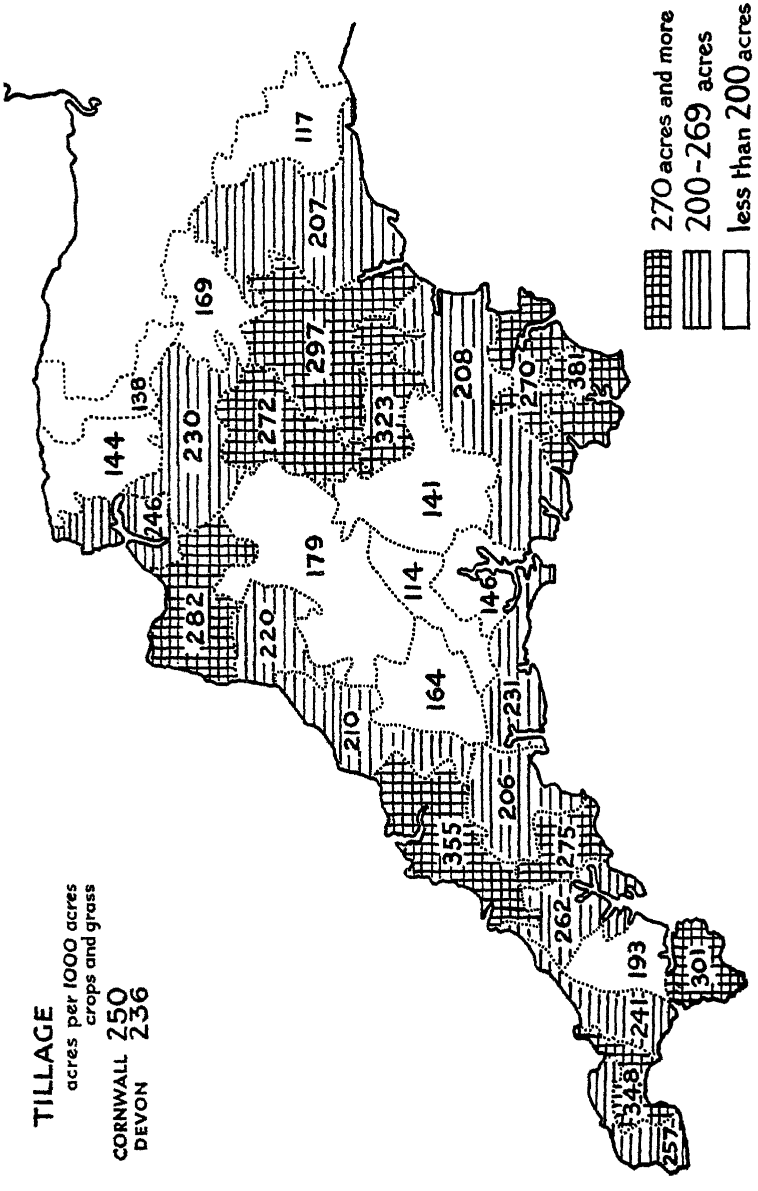
MAP 1.


Sea level to 250'
250' to 500'
500 to 1,000'
1000' to 1,500'
Above 1,500 ft.
DEVON & CORNWALL
TOPOGRAPHY

MAP 2.


RAINFALL
ANNUAL AVERAGE
1881-1915
Under 30 ins
30-35 ins.
35-40 ins.
40-45 ins.
45-50 ins.
50-60 ins.
60-70 ins
70-80 ins.
Over 80 ins.

MAP 3.


TILLAGE
acres per 1000 acres
crops and grass
CORNWALL 250
DEVON 236
▦ 270 acres and more
▥ 200-269 acres
☐ less than 200 acres
117
207
169
297
138
230
144
272
323
208
270
381
141
246
179
114
146
282
220
164
231
210
206
355
275
262
193
301
241
348
257

low lying (mainly below 500 ft.). The land is easy working in most parts of these areas, and is not heavy in any part. Soil, climate (as indicated by rainfall), and topography are mainly responsible for the proportion of tillage.

Wheat. (Map 5.) The same factors which induce some areas to have a relatively high proportion of land under the plough are responsible for encouraging wheat growing, and the wheat map is very similar to the tillage map. Good wheat land, however, must be fairly heavy, and the arable areas where the land is light, such as the Moretonhampstead district and the North Cornwall coast, do not show the same intensity of wheat growing, relative to tillage, as the heavier soils in Mid-Devon and parts of South Cornwall.

Barley. (Map 6.) Some parts of Devon and Cornwall grow a good sample of malting barley. The three districts where most barley is grown, North Cornwall, Exeter, and the South Hams,[1] are those where the rainfall is low, the soil is light, and other conditions are suitable for tillage. The barley map is somewhat similar to the wheat map, but there is this difference: while wheat is distributed fairly evenly in the districts, barley is grown intensively in those tillage districts where conditions of soil, etc., are most suitable to it, but relatively little barley is grown elsewhere. Barley is more discriminating than wheat, and competes successfully with it for the land which is really suited to it.

Oats. (Map 7.) Oats are found mainly in North Devon, and to some extent in South Devon. The oats map does not follow the tillage map closely. This is partly due to the competition of other crops. Where wheat and barley will grow, oats often have to give way. In Cornwall, oats have to face the competition of dredge corn (oats and barley mixed), and the reason that so few "clean" oats are grown in any part of Cornwall is that dredge corn is almost universally the more popular feed for stock throughout the county.

Another reason why oats are found in North Devon more than anywhere else is that they will grow on land that is too cold and wet for wheat or barley. Much land in North Devon, especially in the north-west of the county from, say, Torrington to the Cornish border, is very cold and wet, and on this class of soil oats have practically no competition from other corn crops. Oats, too, are primarily grown as feed for stock in most parts, and they have a particular significance, therefore, in a stock-

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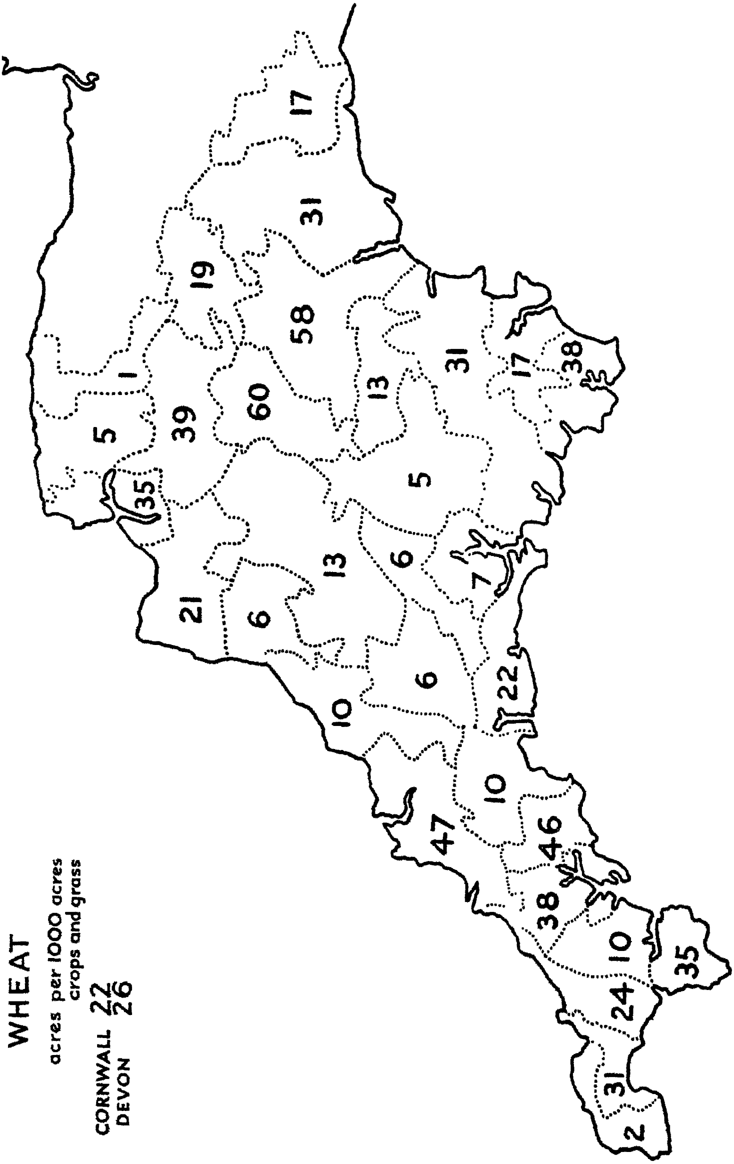
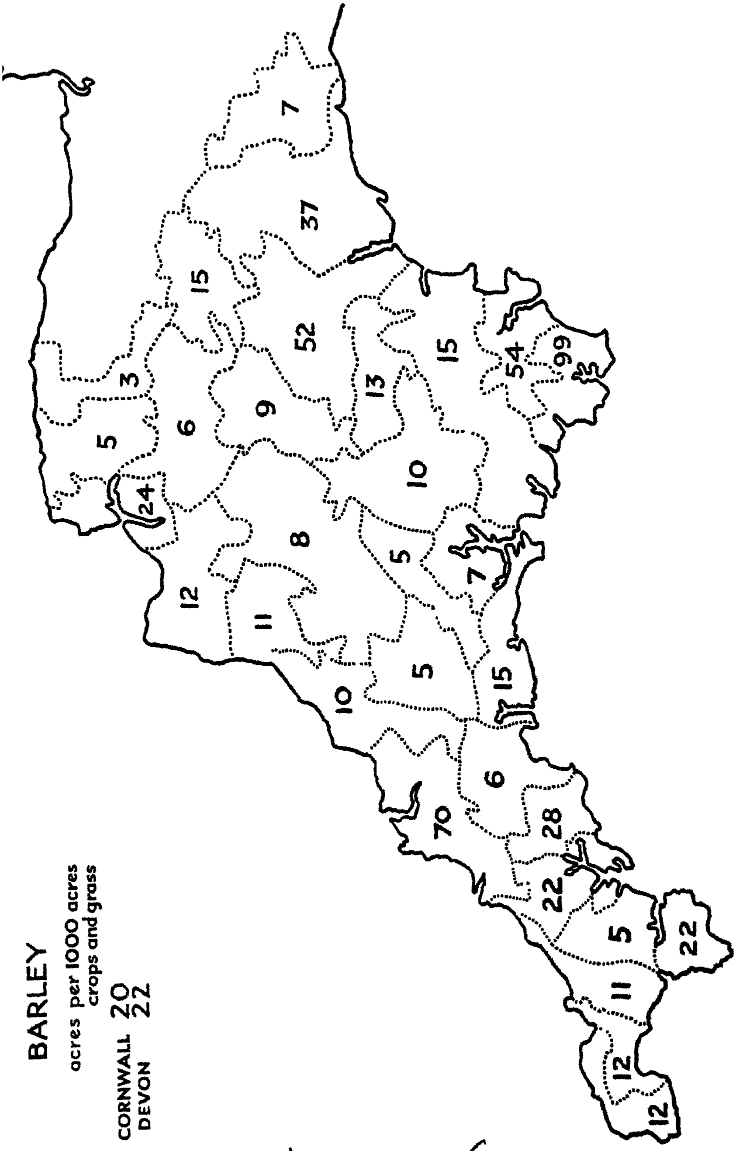
[1] The quality of South Devon barley for malting purposes was renowned more than 100 years ago. Vancouver, writing in 1808, describes a "white ale" which was brewed in the Kingsbridge neighbourhood. "This beverage," he says, "possesses a very intoxicating quality and is much admired by those who *drink not to quench thirst only.*" ("Agriculture of Devonshire," p. 390).

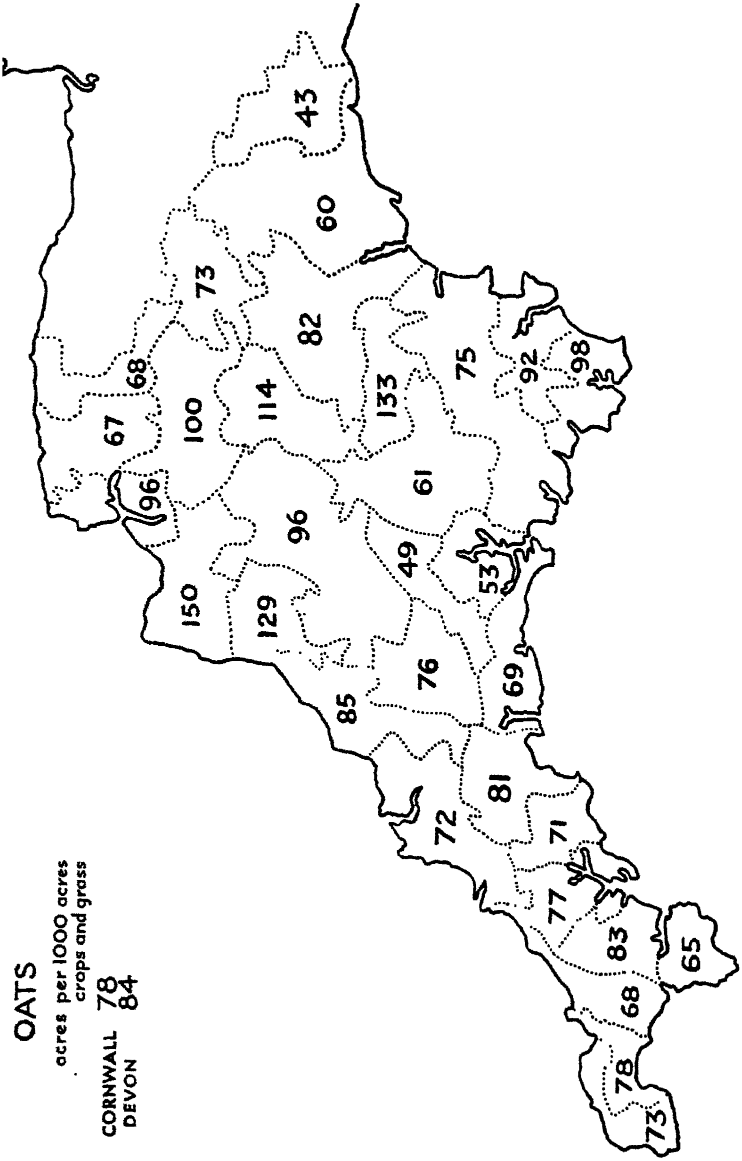

WHEAT
acres per 1000 acres
crops and grass
CORNWALL 22
DEVON 26
17
31
19
58
1
39
5
60
13
31
17
38
35
5
13
6
21
6
7
6
22
10
10
47
46
38
10
35
24
31
2

Map 5.

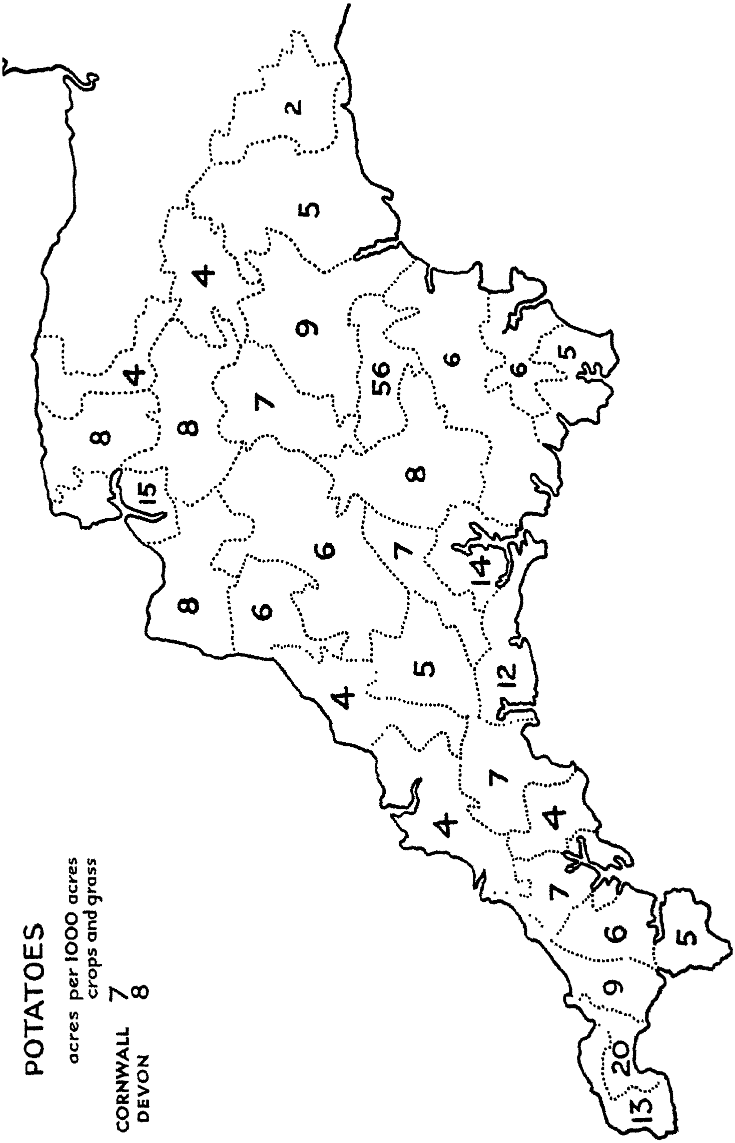

BARLEY
acres per 1000 acres
crops and grass
CORNWALL 20
DEVON 22
7
37
15
52
15
54
99
3
13
5
6
9
10
24
8
5
7
12
11
5
15
10
6
70
28
22
5
22
11
12
12

MAP 6.

192526


OATS
acres per 1000 acres
crops and grass
CORNWALL 78
DEVON 84
43
60
73
82
68
67
100
114
133
75
92
98
61
96
96
49
53
150
129
76
69
85
81
72
71
77
83
65
68
78
73

MAP 7.


POTATOES
acres per 1000 acres crops and grass
CORNWALL 7
DEVON 8
2
5
4
9
4
7
56
6
6
5
8
8
8
15
8
6
7
14
8
6
5
12
4
7
4
4
7
6
5
9
20
13

MAP 8.

raising district like North Devon. A farmer in this district, with only a few acres of land under the plough, will naturally grow crops for his stock, rather than for sale, and since in these districts oats generally do better than any other corn crop, they have very little competition from other corn. At the same time, in a mixed farming region like Devon and Cornwall, oats are invaluable, and where oats have to face the competition of wheat and barley in the more typically corn growing districts of the South West, it must be admitted that they face it pretty well, for the acreage of oats exceeds the acreage of either barley or wheat in nearly every group.

Potatoes. (Map 8.) Potatoes are grown as a cash crop in four areas only in Devon and Cornwall. Elsewhere sufficient are grown for the farm family and labourers, but practically none of the crop is sold.

West Cornwall is particularly suited to early potatoes, where climate, soil, and topography are all favourable. Until recently, however, the competition of imported early potatoes had resulted in a movement away from potato growing to flower culture. The Horticultural Imports Duties have done something to restore confidence in West Cornwall potato growing.

South-east Cornwall and the Plymouth area are suited by climate and topography to early potatoes, and these areas also have a good market in Plymouth for both early and main crop potatoes.

Both these districts are well served by the railway for transport to more distant markets.

North Devon is particularly favoured in its soil. Not so many potatoes are grown here nowadays as were grown in time past, when they were often shipped by boat to South Wales. The parishes where the crop is mostly grown are on alluvial soil at the estuary of the river Taw.

The most interesting potato growing area is the Mid-Devon district which has as its centre Moretonhampstead. Although the land is light and easy to work, its topography is by no means ideal for arable farming, and much of the land is more than 750 feet above sea level. One reason, and possibly the main one, for the high potato acreage is the lack of competition of other crops. The soil, either thin granite or "woodstone," is not suited, and the altitude of much of the land is too great, for successful corn growing, except oats. Permanent grass will not succeed, and the only livestock kept to any extent are sheep.

But there are other reasons besides lack of competing crops why potatoes do well in that area. The soil, although thin, will grow useful potato crops of good quality, and it is very easy to work. Rainfall is fairly high (it varies from slightly below 40 in. in some parts to nearly 60 in. in others), and growers need not fear a drought; there is a supply of casual labour which is easily accessible, while markets in South Devon are near at hand.

Rough Grazing. (Map 9.) This map is included in order to permit proper allowance to be made for the effect of rough grazing on the numbers of stock carried on the various groups. For instance, the 127 dairy cattle on Group 28 (Dartmoor) refers to the stocking per 1,000 acres of crops and grass plus 2,383 acres of rough grazing, whereas Group 29 has 102 dairy cattle per 1,000 acres of crops and grass and only 74 acres of rough grazing. Although rough grazing does not maintain a large head of stock, its effect must be taken into consideration in dealing with livestock numbers.

Another point which deserves emphasis in dealing with livestock is that these figures are based on the 4th June returns. They therefore represent summer stocking and it does not necessarily follow that numbers on hand in the winter would bear a close connection to these figures.

Dairy Cattle. (Map 10.) Dairy cattle are most numerous in West Cornwall and East Devon. In both areas the milk is mainly factory manufactured, although some liquid milk from East Devon is exported "up-country." The prevalence of dairying in East Devon is probably due partly to the large number of small farms, and to lack of competition of a more profitable branch of farming. Vancouver[1] mentions the importance of the Honiton district for butter, which was mostly sold in London. Dairying has persisted in this area since those days.

The reason for the localisation of dairy cows in West Cornwall is partly the small farms, partly the climate and soil, which encourage high yields of good grass, partly lack of competition of a better enterprise, and partly the breed of cattle, Guernseys, or Guernsey crosses. Naturally it is easier to stock intensively with a relatively small breed than with the larger breeds found in most other parts of the South West.

Parts of South-east Cornwall and the area about Plymouth are heavily stocked with dairy cattle owing to the small size of the farms and the excellent markets provided by Plymouth and by the clay-mining district round St. Austell, Roche, and the other China clay towns.

Sheep. (Map 11.) Sheep are found more often on large than on small farms, and are suited to rough, hilly land which is not favourable to most other types of farming. They are found fairly numerously in all parts of Devon except East Devon and the environs of Plymouth, and in East Cornwall. But they are especially typical of the farming of North Devon and of the areas where the proportion of rough grazing is high, *e.g.*, Dart-

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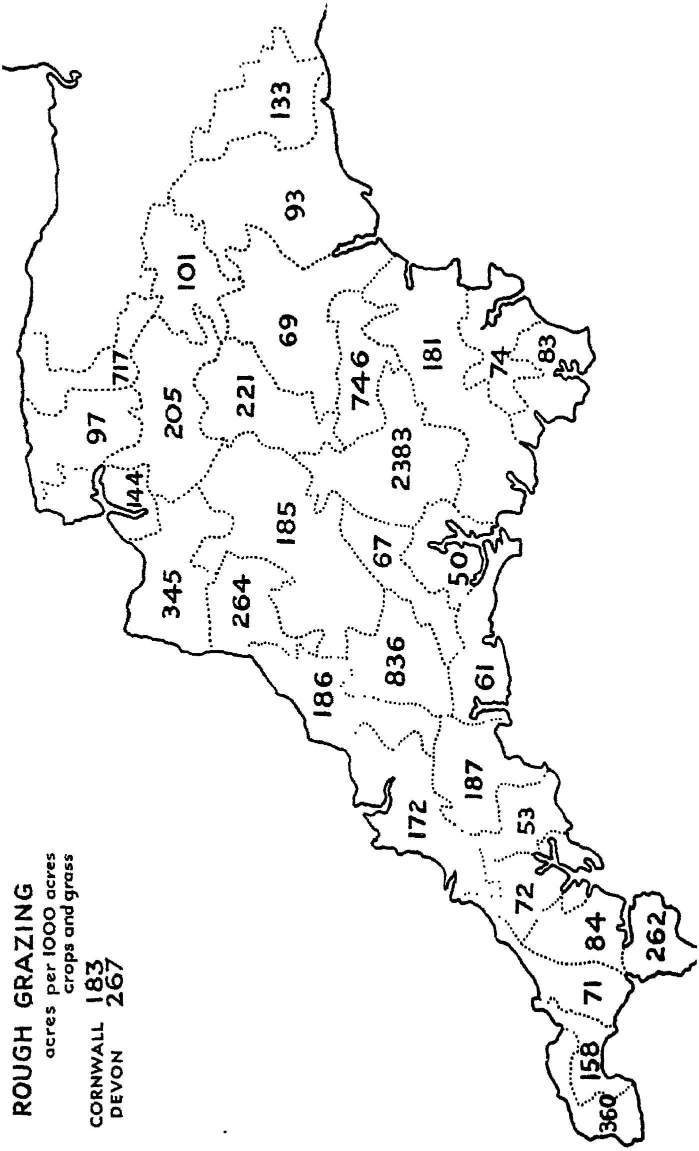
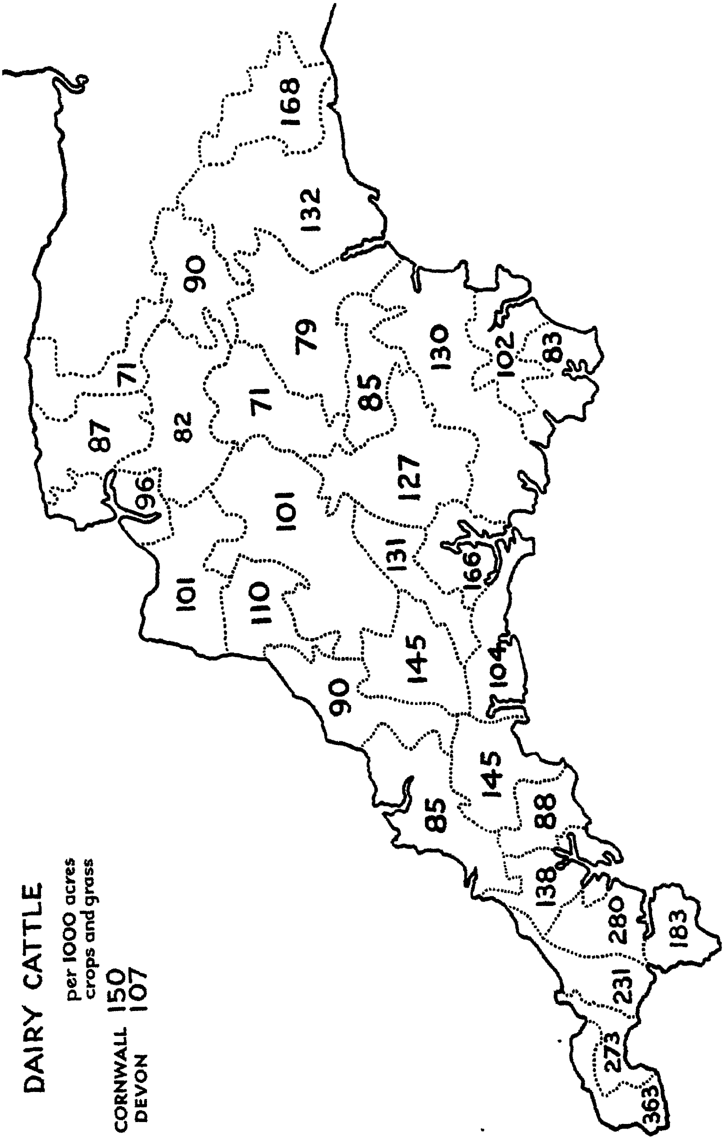
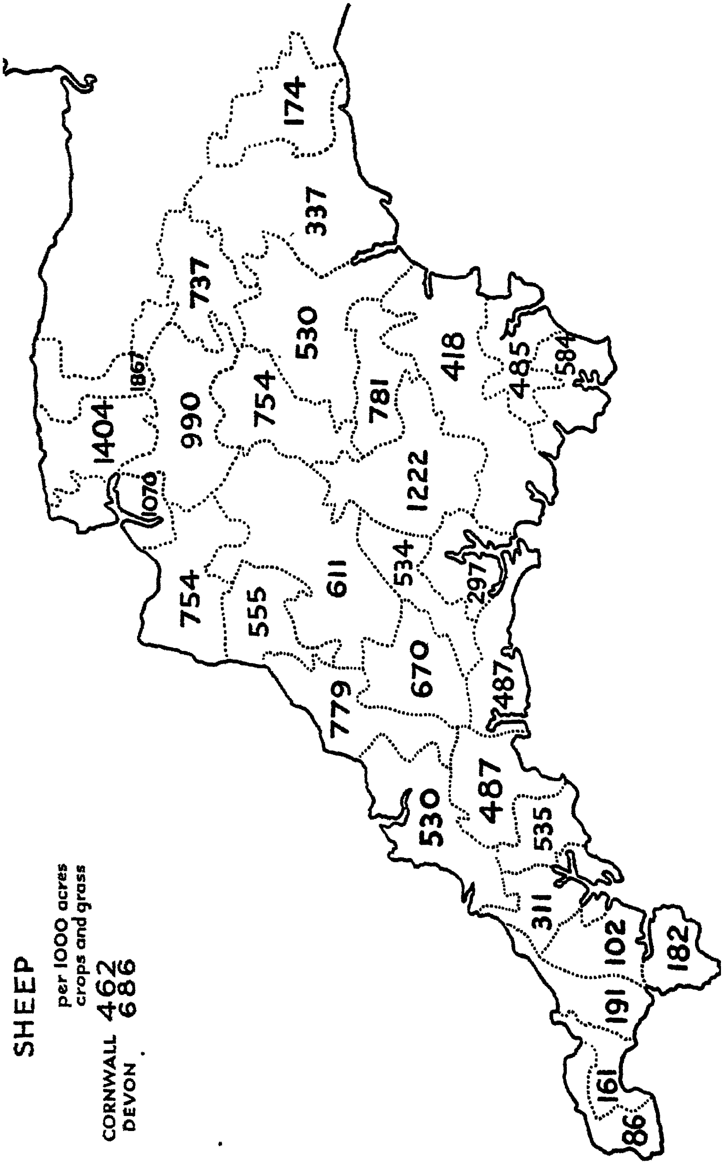
[1] Loc. cit., p. 230.


ROUGH GRAZING
acres per 1000 acres
crops and grass
CORNWALL 183
DEVON 267
133
93
101
69
717
205
221
746
181
74
83
97
2383
144
185
67
50
345
264
836
61
186
187
172
53
72
84
262
71
158
360

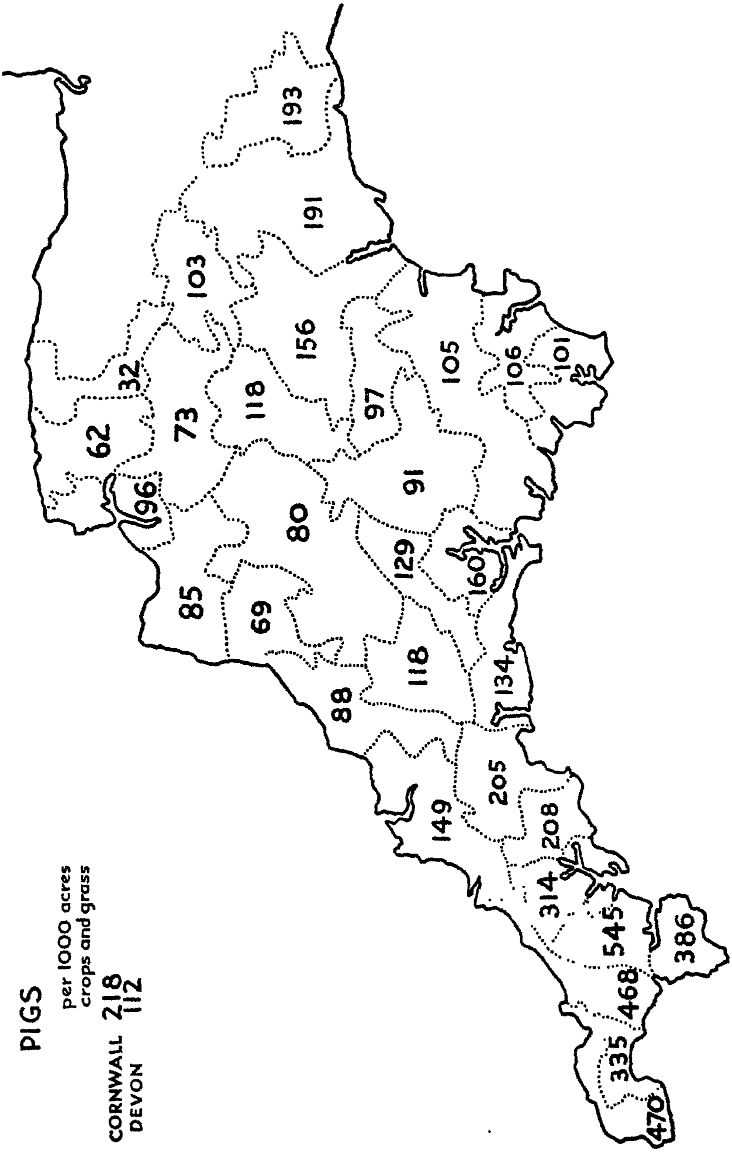
MAP 9.


DAIRY CATTLE
per 1000 acres crops and grass
CORNWALL 150
DEVON 107
168
132
90
79
71
71
82
87
85
130
102
83
96
127
101
101
110
131
166
145
104
90
145
85
88
138
280
183
231
273
363

MAP 10.


SHEEP
per 1000 acres
crops and grass
CORNWALL 462
DEVON 686
174
337
737
530
1867
1404
990
754
1070
418
485
584
781
1222
611
534
297
754
555
670
487
779
530
487
535
311
102
182
191
161
86

MAP 11.


PIGS
per 1000 acres
crops and grass
CORNWALL 218
DEVON 112
193
191
103
156
105
106
101
32
118
97
73
62
96
91
80
129
160
85
69
118
134
88
205
149
208
314
545
386
468
335
470

Map 12.

moor and Exmoor. They owe their localization to lack of competing branches of farming in these areas, and to the fact that natural conditions (climate and topography) are very suitable. North Devon and the moorland areas produce more agricultural products than are needed for local consumption, and as an external market has to be sought, the produce of the area must necessarily be in a form that will travel for long distances. Production, therefore, takes the form of cattle, which are mainly sold as stores to the Southern Counties and elsewhere, and sheep, many of which are slaughtered locally for sale on the London market.

The North-eastern part of Cornwall has more sheep than any other section of the county. It is a usual practice to put many of these sheep on rape in late summer and early autumn (the land is too sour to grow turnips or swedes successfully) and then to sell them to the arable farmers of the Exeter district, where they are folded on roots. A winter census would show a relatively much heavier sheep population for this latter section than is indicated on the map.

In South and East Devon and in West Cornwall the competition of other branches of the farm is too keen for sheep to obtain a firm foothold in the farming system.

Pigs. (Map 12.) Very few counties are more densely stocked with pigs than Cornwall, while in absolute numbers Devon is generally in the first three. The importance of pigs in the South West is indicated by the fact that of late years Devon and Cornwall have between them provided nearly 10 per cent. of the total pig population of England and Wales. Map 12 shows that the distribution of pigs in the various sections of the two counties varies very considerably. The two main areas where pigs are to be found are West Cornwall and East Devon. In addition, a small area in the neighbourhood of Plymouth is heavily stocked with pigs.

The concentration of pigs in West Cornwall depends largely on the heavy cow population and the necessity for dealing with the milk, nearly all of which is manufactured. Factories manufacture the cream into butter, some of them separating the milk and others buying cream which has been separated on the farm. The separated milk remains to be dealt with, and, with very little calf rearing undertaken, this milk is mainly converted into bacon or pork. The reason for the large pig population in this area is not so much the usual natural or economic factors as the complementary position which pig keeping occupies in relation to dairying. In addition, the small size of farm which is usual in West Cornwall suggests that pig keeping by itself would probably be undertaken without the connection of the industry with dairying.

The pig population of East Devon is much less dense than that of West Cornwall, but more pigs are kept in that area than in any other part of the two counties, apart from West Cornwall. To some extent, the same reasons—dairying and small farms—which account for pigs in West Cornwall can be given for the relatively intensive pig population in East Devon. The farms are in fact small and dairying is carried on fairly vigorously. There is this difference, however: the milk produced in East Devon is collected by factories which either send it direct to a consuming area, or convert it into a product such as milk powder. A little separated milk is available from some factories, but the proportion is much less than in West Cornwall, and what there is is mainly fed to calves. The reason for the concentration of pigs in East Devon is at first, therefore, not easy to discern. The solution to the problem is probably historical. Farm butter was made in East Devon long before the factories were erected, and pigs had a distinct place in the farm economy to help utilise the skim milk. It is reasonable to suppose that the pig keeping tradition has persisted even since the supply of milk, which once made pigs essential to the farm, has become less plentiful. On the other hand, there is no doubt that the factories, by practically eliminating the farm butter-making industry, are tending to diminish the importance of pig keeping in East Devon. Stocks of pigs in the country generally increased considerably from 1928 to 1932, and the county figures for Devon show an increase of 18 per cent. between these years; in 20 representative East Devon parishes, however, there was an increase during these four years of less than 2 per cent., according to some additional information supplied by the Ministry of Agriculture. Ten of the parishes actually recorded fewer pigs in 1932 than in 1928. There seems little doubt, therefore, that the wider area which the factories now cover is definitely depriving pigs of the differential advantage which they previously held in East Devon compared with other parts of the county.

The concentration of pigs near Plymouth can be attributed to the small size of the farm, the amount of swill available from the town, and the large percentage of land under orchards.

These maps, which are selected as being some of the more striking of the area which they represent, indicate the wide variations in the farming of a relatively small district, and the differences in the problems, both of production and of disposal, which confront the farmers in different parts of the area.

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SOME RESULTS OF FATTENING BULLOCKS IN OPEN YARDS.

FATTENING YARD BULLOCKS IN NORFOLK.

THIS article gives an account of the experience obtained at the Norfolk Agricultural Station in the fattening of bullocks in yards, the system being fairly typical of that practised in Norfolk.

This practice is of necessity confined to winter, when roots and beet by-products are available. The period of yard feeding extends roughly from October till April or May, though two or more lots of animals may be fattened in this time. Stores are purchased in October and may have a week or two on the meadows, with a few swedes, turnips or sugar beet tops thrown out, before being brought into the yards. The class of animal generally used is the Irish or North Country store, purchased in the local market, at from two to three years old and weighing from 7 to 10 cwt., live, when purchased. The type of store purchased depends upon the choice of the individual feeder. The cattle are bought in lots of from 10 to 40 bullocks, according to the requirements of the feeder, who likes them to be as "level" as possible, and of approximately the same age and weight. The majority of the cattle are Aberdeen Angus or Shorthorns, or crosses between the two breeds.

The bullocks are housed in open yards which are roofed, usually on the north side, to provide some shelter in rough weather. The root or "root substitute" part of the rations is fed in bins in the open, and the hay and concentrates are fed under cover. Hay from a one-year ley is fed either long in racks, or chaffed and mixed with the cake and meal. Some chaffed straw may be used, although that is not the practice at Sprowston.

Typical rations which have been fed at Sprowston, and which have been successfully used in the county during the last few years are: 120 lb. roots, or 14 lb. dried sugar beet pulp (plain) or 80 lb. wet sugar beet pulp, or 100 lb. beet tops; 7–10 lb. hay; 1–2 lb. decorticated ground-nut cake or decorticated cotton-seed cake; and 3–6 lb. of maize meal, flaked maize, crushed oats or barley, either alone or mixed in varying proportions, the lower quantities being fed at the beginning and the higher quantities at the end of feeding.

Where no sugar beet is grown, swedes are the normal pre-Christmas feed, being afterwards replaced by mangolds. Sugar beet growers have the choice of beet tops up to January, finishing off on mangolds or dried beet pulp or clamped wet pulp. Alternatively, dried or wet beet pulp forms part of the "root" ration throughout fattening. Much depends upon the individual circumstances of the feeder as to which course is adopted.

The yards are littered with fresh unchaffed straw every alternate day or more often if conditions necessitate it. The yards are mucked out before the bullocks are brought in, but not again until the manure rises so far that the bullocks cannot feed comfortably at the bins. Usually the yards have to be mucked out during the third or fourth month of fattening.

It will be realized that yard feeding differs radically from stall or box feeding. Compared with the latter, yard feeding may be regarded as beef production on an extensive scale. Yard feeding is open-air feeding, and there is no individual rationing of the bullocks. The food is placed in the bins, and it is not possible to control the quantity that each bullock actually consumes. Obviously the same individual attention cannot be given as in stall or box feeding, no matter how conscientious the yardman may be. The cattle are in the open air whatever the weather, and their movements are less restricted than when tied up or in loose boxes.

AN INTRODUCTION TO THE RESULTS.

The bullocks to which this article refers were fattened in the years 1925 to 1933. In every year, with the exception of 1926, the same class of store was purchased, either privately or on Norwich market, and in all but two years they were bred in the North of England. When brought into the yards towards the end of October they averaged about 8 cwt. each live-weight, being just under two years old. The largest number of bullocks fattened in any one year was 65, and the smallest number 37.

The bullocks were fed on rations compounded according to T. B. Wood's figures for starch equivalent and protein, and were calculated to produce 2½ lb. of live-weight gain per bullock daily over the whole period of fattening. Frequent dry-matter determinations were made on the roots or root substitute part of the rations, to serve as a check on the starch equivalent values. The bullocks were fed three times daily, at 6 a.m., 10 a.m. and 2 p.m. All hay was chaffed and fed with the cake and meal. Roots were sliced before feeding, and dried sugar-beet pulp, when fed, was soaked for 12 hours previous to feeding. The cake and meal, hay and dried sugar-beet pulp were weighed out daily to each yard. Wet pulp, roots, and sugar-beet tops were fed at so many "skeps" per day per yard, with frequent check weighings of the weight per "skep". Thus the total amount of food fed daily to each yard of bullocks was known in each year.

In every year feeding trials (dealing chiefly with sugar-beet tops and pulp) have been carried out with the bullocks. This necessitated the splitting up of the bullocks into two or three separate yards of 10 bullocks each, of approximately the same average live weight per head. Every bullock was weighed individually on entering the yards, at the end of each month of the fattening period and finally when taken from the yard to be sold. Hence the record of each bullock as regards live-weight gain was known for each month from the time he entered the yard to the time he was killed.

By collecting and examining statistically the data so obtained over the seven years information is disclosed relating to various points, such as variations in the monthly live-weight gain, feeding for a standard daily live-weight gain, length of fattening period and so on. The statistical methods used in the examination of the data need no explanation, but reference may be made to *Statistical Methods for Research Workers*, by R. A. Fisher, and *An Introduction to the Theory of Statistics*, by G. Udny Yule.

The records of bullocks that were fed on sugar beet tops have been excluded, for it has been shown[1] that the full theoretical feeding value of sugar beet tops cannot be recovered in yard feeding. Twenty-six bullocks that were fattened in 1926 have also been excluded as they were much heavier and older as stores. This reduced the number of bullocks, for which normal records were available, to 173 ; the average live-weight increase was 2·1 lb. per day, and they were fattened, on the average, in just under 22 weeks. There were wide variations in the time taken to fatten and although the majority (82 per cent.) finished in 24 weeks or less, and some 47 per cent. in 20 weeks or less, a rather disturbingly high proportion—18 per cent.—took over 25 weeks before they were ready to kill. As the bullocks weighed approximately 7.9 cwt. each as stores, and 10·7 cwt. fat, the average live-weight increase, to the nearest ·1 cwt., was 2·8 cwt.

According to the text books, a yard-fed bullock will take about 20 weeks to fatten, and during that time will increase about 2 lb. daily, *i.e.* 2½ cwt. over the complete period. If this be taken as the general preconception of the progress of a yard of bullocks, the Sprowston results were not typical. They differed in one important aspect : the bullocks took on the average two weeks longer to finish.

But it must not be supposed that a speedy fattening period is necessarily a profitable one, or more profitable than a slower period. The feeder's margin, *i.e.* the difference between store and beef prices, affects the policy of the stockman. When the margin is great the more cattle finished in a given time, the better should be the financial result; two lots of animals through the yards in one winter is then the aim of many feeders; but when beef prices are near or below store prices, there is less incentive to be deeply committed with fattening beasts. In these circumstances it is often preferable to feed on a lower plane, and for a longer time, employing the cattle more as straw tramplers than in any other capacity.

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[1] F. Rayns, "Bullock Feeding on Sugar Beet Tops." *Journ. R.A.S.E.*, 1932.

There is also, of course, much difference of opinion as to the amount of "finish" which it will pay to put on an animal, and those passing through the fat-sale rings vary enormously; some are often no better than stores; others are presented with the finish of Christmas fat stock cattle. The extent to which the "finish" is taken obviously affects general deductions such as those made in this article. The Sprowston cattle are always well, but not extravagantly, finished. The usual handling points—the loin, scrotum and so on, are filled well enough to satisfy a critical and discriminating butcher.

Still, most persons who study the art and science of cattle feeding, regard quick results as desirable, and in this article that outlook has been adopted. But the extent to which live weight may be increased and length of fattening decreased seems, from these results, to be limited by the capacity of the animals to respond to improved management. This is illustrated by examining the data in the following paragraphs.

FACTORS INFLUENCING LIVE-WEIGHT GAIN.

(a) *Feeding for a Standard Daily Live-Weight Gain.*

It has already been mentioned that the cattle under review were so fed that each could, theoretically, on the rations consumed, increase in live weight by at least 2½ lb. daily or 1¼ stones per week. In this respect a yard of cattle is not unlike an efficient factory, the output of which can be estimated and finally checked. With cattle a similar attitude is possible; the amount of live-weight increase can be forecast and the results checked by means of the weighbridge, but the individual output will undoubtedly be variable; it is to the causes of this variation in individual output that the critical mind will be addressed.

In the case of the 173 fattening bullocks the average daily live-weight increase was 2·1 lb.; it was expected to be 2·5 lb. In other words, the factory as a whole failed to deliver the predicted output. The magnitude of the failure is indicated in Table I following, in which the actual and anticipated live-weight increases are compared. Wood's standard maintenance requirement has been assumed to apply to yard-fed bullocks, and this having been deducted from the total starch equivalent of the ration, the remainder has been assumed to be recoverable in live-weight increase according to Wood's Production Standards. Thus in 1932 the total daily ration of starch equivalent was 12·8 lb., of which 6·0 lb. was required for maintenance, the remaining 6·8 lb. being available for transformation into live weight at the rate of 2·7 or 3·0 lb. of starch equivalent per pound of live-weight increase, according to the stage of fattening (see below). Then the predicted daily live-weight increase would be 2·5 lb. or 2·3 lb. respectively.

TABLE I.

Actual and predicted live-weight increases year by year.

	Actual.	*Predicted.*	
	Over whole period.	For Stores "Fresh Condition"[1]	For Stores half Fat.[2]
1925 . .	1·9	2·6	2·4
1926 . .	—	—	—
1927 . .	2·4	2·8	2·6
1928 . .	2·5	3·2	2·9
1929 . .	2·0	2·7	2·5
1930 . .	1·9	2·7	2·5
1931 . .	2·1	2·7	2·5
1932 . .	2·1	2·5	2·3

It is necessary to show the predicted live-weight increases in two ways so as to avoid a difficulty. Wood, whose writings are authoritative on this subject, varied the amount of starch equivalent to produce 1 lb. of live-weight increase according to the age and the stage of fattening, and it is obviously difficult, therefore, to give one set of figures showing the predicted live-weight gains for a large number of animals varying both in age and in condition. As, however, most of the animals were about two years old when they started feeding and over two years old when they finished, Wood's standards for "over two years old, fresh condition" and "over two years old, half fat condition" have been applied. The results show quite clearly that the actual performance of the bullocks was appreciably lower than was expected.

A limit to the capacity of the animals to respond to liberal feeding is indicated, for at no time was it possible to obtain more than 2·5 lb. per head daily from a yard of bullocks.

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[1] Assuming 6 lb. starch equivalent for maintenance and 2·7 lb. S.E. for 1 lb. live-weight increase.

[2] Assuming 6 lb. starch equivalent for maintenance and 3.0 lb. S.E. for 1 lb. live-weight increase.

In the following table the individuals have been grouped to illustrate this point.

TABLE II.—*Whole Period of Fattening. Daily Live-weight Increases.*

	Percentage.
Bullocks giving 2·5 lb. and over per day	30
,, ,, less than 2·5 lb. ,, ,, ...	70
,, ,, 2 lb. and over ,, ,, ...	82
,, ,, less than 2 lb. ,, ,, ...	18
Total No. bullocks	173

Only 30 per cent., therefore, responded satisfactorily to the comparatively high 2·5 lb. daily standard, but a much larger proportion—82 per cent.—increased by 2 lb. or more per day. Two main conclusions seem possible at this point; it is comparatively easy to obtain 1 stone of weekly increase in the live weight of a fattening bullock, and secondly, it is equally easy to overfeed in the hope of obtaining appreciably larger daily live-weight gains.

Nine per cent. of the animals gave increases of over 2·75 lb. per day and 4 per cent. over 3·25 lb., and it does seem reasonable to suggest that more would have responded in a similar manner had the feeding been more liberal. Actually no bullock should, in theory, have put on more than 2·5 lb. daily; the food, theoretically, was not there for the purpose. But while it is more than likely, in yard feeding, that some animals obtain more food than others, those with a high potentiality for live-weight increase must be handicapped by the complete impracticability of individual rationing.

(*b*) *The Monthly Live-weight Gains.*

There is given in Table III on p. 68 an extension of the data summarised in the preceding table. The mean daily live-weight increases are given in half-pounds, but they include live-weight gains of ¼ lb. on either side of the mean. Thus, a live-weight increase of 2.5 lb. per day includes all cattle increasing in daily live weight between 2·25 and 2·74 lb. Similarly, live-weight gains ranging from 0·75 to 1·24 lb. are given as 1 lb. per day. On two occasions in December and on one in January, frost or snow prevented the usual monthly weighings, which explains the variation in the number of bullocks included in the table in the first three months.

TABLE III.—*Variation in the daily Live-weight Increase at successive stages of fattening of a Number of Bullocks—expressed as per cent.*

Live-weight increase per head per day, lb.	1st month.	2nd month.	3rd month.	4th month.	5th month	6th month.	Whole Period.
Less than ·25 lb.	4	2	2	1	—	—	—
0·25	8	2	9	1	—	—	—
1·0	14	8	20	8	14	—	1
1·5	19	16	24	22	10	10	17
2·0	15	25	23	23	28	50	52
2·5	16	19	8	25	14	20	21
3·0	13	14	7	18	19	10	5
3·5	6	6	4	—	10	10	4
4·0	2	4	3	2	—	—	—
4·5	2	4	—	—	5	—	-
5·0	1	—	—	--	—	—	—
Average daily live-weight gain—lb.	1·8	2·4	1·8	2·1	2·3	2·2	2·1
No. of bullocks	163	118	99	73	21	10	173

Store cattle destined for the arable feeders in England must travel many miles, often by sea, rail and road, before they reach the feeding premises; thus they are, perforce, brought into new surroundings and introduced to unfamiliar foods. And, in spite of the short preliminary period on grass when roots are thrown out to the cattle, the first month of feeding in the yards is usually accompanied by unsatisfactory live-weight increases. Only twice in eight years was the average increase, in the first month of feeding, 2 lb. or more daily; on six occasions it was below 2 lb.

There is a very curious parallel between the first and third months' results; the average increase happens to be the same, and in three years only were the increases greater than 2 lb. daily. Progress in the remaining months was more normal, although the actual did not at any time equal the predicted live-weight increase. The slow start is a matter of some importance, for the first month is sometimes assumed to be a period of great progress. The records at Sprowston do not support that view. The slow start should be reduced by careful management in the early stages, *e.g.* by drawing out the more pugnacious cattle, by a quiet and friendly attitude on the part of the stockman and by the provision of ample feeding space. During that month the efficiency of the ration or of the stock consuming it appears to be low; more food is wasted, not by trampling underfoot, but by undue exercise, excitement and general restlessness than at any other period during fattening. The heavier stores, however, do better in the first month than the lighter ones :—

TABLE IV.—*Store Weight and Live-weight Increase in First Month, lb. per day.*

Store live weight	7 cwt.	8 cwt.	9 cwt.
Live weights in first month, lb. per day .	1·7	2·1	2 1
No. of bullocks	48	78	33

Correlation coefficient $+ \cdot 249 \pm 0 \cdot 075$.

No very definite evidence can be put forward as to why the live-weight increases in the third month are less, although a number of possible reasons may be offered. They are worth exploring because they include at least one strong conviction of Norfolk bullock-feeders, who have themselves observed that yard-fed cattle do not " do " so well in the third month. It happens that the third month (January) coincides with the change, in Norfolk cattle feeding, from swedes to mangolds. Hence the change in feeding is popularly supposed to account for the lower live-weight increases in the third month. Is this the explanation or has the weather in January any effect on live-weight gains ? Are the conditions underfoot worse for the cattle in January and have they less incentive, in consequence, to lie down when not feeding ? Since also we usually muck out the yards in January, do we as a result unsettle the bullocks and stop them " doing " ? Again, many of the cattle at Sprowston are losing their teeth during January. Is this factor of any importance ? Let us take the swede to mangold change-over first. There have been occasions when no roots have been fed to stock at Sprowston, when, in fact, there has been no change from swedes to mangolds. In the same years adjoining yards of cattle have been fed on swedes, then on mangolds. By grouping the results of 1930 and 1931, when these possibilities arose, there is shown to be little, although perhaps some, foundation for the suggestion that root substitution interferes, temporarily, with live-weight increases.

TABLE V.—*Live-weight Increase per head per day (lb.) with Pulp and Roots Feeding.*

Feeding.	2nd month (December).	3rd month (January).	4th month (February)	No. of bullocks.
Beet pulp	2·2	1·5	1·8	20
Swedes, then mangolds . .	3·0	1·8	1·9	20

In both years mangolds were fed from the end of December onwards. No more need be said than that the " January drop " occurred with beet pulp as well as with root feeding. The drop, however, is greater with root feeding than with pulp feeding, and may partly be explained by the change from swedes to mangolds.

The fall in the third month seems to be associated also, to a small extent, with the weight of the store ; the heavier the store the smaller the "drop". This might suggest that dental changes are also a factor in monthly live-weight increases, since the heavier cattle might easily prove to be the older cattle. Unfortunately, it is impossible to group them according to age and so to compare the performance of those which would normally shed their teeth in January with the others. Hence it would be unwise to assume that the heavier cattle, in the following table, are necessarily the older cattle, to argue subsequently that all weights (ages) are subject to the "drop" and that dental troubles definitely depress live-weight increases. It is only safe to regard the data as a correlation between store weight (not age) and the third-month depression.

TABLE VI.—*Relation of Store Weight to Third-month "Drop".*

Store Live Weight (October).	Live-weight increases per head per day (lb.) Mean of Nov. & Dec.	January.	Decrease.	No. of bullocks.
7 cwt.	2·0	1·4	0·6	7
8 „	2·2	1·7	0·5	44
9 „	2·0	1·8	0·2	16

Correlation coefficient $-0{\cdot}236 \pm 0{\cdot}075$.

There remains the possibility that the cattle were underfed during the third month. It is, of course, accepted by all interested in bullock fattening that more food must be fed as the cattle increase in weight. There are scientific reasons to support this general practice. But if underfeeding explains this unwelcome experience it means that the standards on which the cattle were fed during the third month are inaccurate or, to be more specific, do not increase in starch equivalent sufficiently in the early stages of fattening. This suggestion, however, is not supported by the live-weight increases in the years when the concentrates were increased at the end of the second month and when there was no possibility of underfeeding.

TABLE VII.—*Effect of Increased Concentrates on Third-month "Drop".*

At end of 2nd month concentrates,		Daily live-weight increases. 2nd month. Predicted.	Actual.	3rd month. Predicted.	Actual.
(*a*) Increased	1930–31 . . .	2·7	3·0	2·9	1·2
	1925–26 . . .	2·4	1·6	2·5	1·6
(*b*) Not increased	1932–33 . .	2·4	2·0	2·3	1·6
	1931–32 . .	2·2	2·4	2·2	2·6

The smaller live-weight gains in the third month must, therefore, be left unexplained, except for the slight indications already noted. Perhaps, after all, the fatalistic suggestions, which one usually dismisses when the stockman makes them, concerned with weather in January, yard conditions and so on, have some influence.

The only other matters worth comment in connection with the monthly live-weight gains are the uniformity of the gains in all months except the first and third, and the gradual narrowing of the range of daily live-weight increases as the animals become fat. The latter is particularly noteworthy after the end of the third month, and is experienced even with those animals taking longest to finish.

It may be observed from Table III that the wide range of daily live-weight increases ceases at a time when some of the more forward cattle would be drawn out for sale. The remainder would then be expected to " do " better after the withdrawal of the most vigorous competitors for food. That is not so, however. It is possible to compare the increases of 69 bullocks before and after the first draft of forward cattle to the butcher, the first draft consisting roughly of one-fifth of the bullocks in each yard.

TABLE VIII.—*Effect of first Butchers' Draft on Progress of Remaining Cattle.*

Average live-weight increase per day, month previous to first draft	2·1 lb.
Average live-weight increase per day, month after first draft	2·2 lb.
No. of bullocks	69

In fact, the extra yard space, bin space and (presumably) decreased buffeting about, had no significant effect on the live-weight increase of the cattle left after the first draft to the butcher. But it is emphasised that the above comparison is between the increases in the month previous to the first draft and the month following it, *i.e.* after the cattle had settled down and the hurly-burly of the first month was over.

(c) *The Capacity of the Bullock to respond to Feeding.*

Of the many factors which determine the capacity of a bullock to respond by increased weight to good treatment, the individuality of the beast is perhaps the most important. It is probable that the breeding of the animal determines the ease with which it fattens or " finishes ". Increase in weight is not necessarily associated with " finish " even after a long period of feeding, and animals are present in many yards which are difficult to get into a condition attractive to the butcher, despite their satisfactory live-weight increases. In general, the causes of individual variation in fattening cattle are either inherently physiological, and therefore beyond the scope of this article, or else are related to diseased livers, tuberculosis or other diseases which can be identified only after slaughter. Whatever the cause, however, individual variation is magnified rather than minimised in yard feeding and is the cause of much loss to the cattle feeder.

There has already been passing reference to the extent of variation in individual performance. While 82 per cent. of the animals proved reasonably satisfactory and increased by 2 lb. or more daily, no more than 30 per cent. put on more than 2½ lb. daily, and only 9 per cent. reached a daily level of over 2·75 lb. At the other end of the scale 18 per cent. failed to gain even as low an amount as 1·75 lb. daily.

All the cattle had, according to Wood's standard, the opportunity of taking ample food to put on 2½ lb. daily ; only 30 per cent. could do it, but a much greater proportion (in total 82 per cent.) were capable of putting on 2 lb. of live weight daily. Whether it would be true to say that only thirty out of every hundred 7–8 cwt. store cattle will put on over 2½ lb. daily is uncertain. It is clearly less risky to expect 2 than 2½ lb. per day, for there is obviously a much better chance—at least twice the probability—of obtaining the former than the latter, regarding the speculation solely, for the moment, as controlled by the capacity of the individual. Omitting unscientific and wasteful feeding, such for instance, as feeding excessive quantities of concentrated food, there are obviously few stores which are likely to justify very high feeding. According to this information about one in ten stores is capable of sustaining a 3 lb. per day average, one in three is good enough for 2½ lb. per day, but eight out of ten will respond to a 2-lb. standard.

This inherent variation in potential live-weight increase is not confined to animals of any particular store weight. The lightest and heaviest bullocks increasing less than 1·75 lb. daily weighed 6·5 and 9 cwt. respectively as stores, as did the ones increasing over 2·25 lb. daily.

But although varying live-weight increases were obtained from stores of all weights, live-weight increases over 2·25 lb. daily were more frequently obtained from the heavier bullocks. The records of the eleven best bullocks, which increased just over 3 lb. per day over the fattening period, show that they weighed on the average 8.2 cwt. each when they were driven into the yards. They put on 3·0 lb. per day from November to January and 3·1 lb. from February to the finish : in total their average live-weight increase was 3·0 lb. daily. Their range in store weight was from 8 cwt. to 9 cwt. Unfortunately it is not possible to give any further detail, but it is as well to emphasise again that they were fed on a ration compounded to produce no more than 2½ lb. of daily live-weight increase.

If it were possible to obtain before feeding some measure of the likely response, the plane of nutrition could and would be varied by careful feeders to their obvious advantage. The only method at present is by eye judgment—at all times less reliable than we think—and by knowledge of the breeding, which is rarely available in the store market.

The Eastern Counties arable farmer, who often has no facilities for breeding, and who must, in consequence, buy his stores, is in a less advantageous position than the breeder-feeder. The latter should know all about his stock; an animal bred and reared on the farm where it is to be fed is likely to convert its food into beef more economically than any other, and the output of individuals should be more uniform.

It is not possible to deduce from the data the maximum live-weight increase which could at any time be expected from a fattening bullock. Clearly we cannot expect any animal, cow, pig or bullock, to continue to respond without fail to an increased ration; and while it is not apparent, from the data, that 3 lb. per day would never be exceeded, there is a strong suggestion that it would rarely be wise to feed for more than 2½ lb. daily.

The skill of the stockman attending yard-fed cattle is even more intimately concerned with their well-being than it is with box or stall fed animals. A good man appreciates the value of rest to fat stock and his actions in encouraging his yard-fed beasts to lie down as much as possible are supremely scientific. There are opportunities for exercise in yards which are impossible in boxes or stalls; undue exercise means wasteful feeding, for energy derived from the food is used for walking about rather than for putting on fat. So the yardman, by his quiet demeanour, his insistence that the cattle shall not be disturbed, his anxiety when the yards are being strawed down, or when strangers are about, undoubtedly affects the capacity of a fattening animal to utilise its food to the greatest extent. This aspect may seem, perhaps, out of place in this article, and there is nothing to offer but mere assertion in support of the opinions expressed, for no one, so far as we are aware, has tried to measure the influence on animal live-weight increase of a good or bad stockman. It seems likely, however, that the results would be illuminating.

(*d*) *The Influence of Store Weight.*

There is a very slight correlation between store live-weight and daily live-weight increase, as is shown in Table IX.

TABLE IX.—*Relationship of Initial Live Weight and Daily Live-weight Gain during Fattening.*

Weight of store. cwt.	Average daily live-weight increase. lb.	No. of bullocks.
6	2·2	6
7	2·0	48
8	2·2	78
9	2·3	33

Weight of Store. cwt.	Number of bullocks expressed as per cent. Gain per head per day, lb.					Total bullocks.
	1½	2	2½	3	3½	
6	33	50	17	—	—	6
7	19	57	21	4	—	48
8	14	46	33	4	3	78
9	9	49	23	12	6	33

Correlation coefficient + ·200 ± 0·075.

The second part of the table is an extension of the first and shows the proportions of the cattle giving specific live-weight increases.

In the majority group (live-weight increase between 2 and 2½ lb. daily) the low live-weight increases seem to be more frequently associated with the lighter stores ; 33 per cent. of the few 6-cwt. stores are in the 1½ lb. daily group and are accompanied by only 9 per cent. of the 9-cwt. stores, 14 per cent. of the 8-cwt. stores and 19 per cent. of the 7-cwt. stores. The higher live-weight gains are almost entirely associated with 8–9 cwt. stores, but there is no positive proof, from the data, that heavy stores will gain more daily than lighter ones, although there is a suggestion to that effect.

If fattening cattle are to command an enhanced price when sold they must be finished. Fatness or finish is complementary to live-weight increase. Two animals may increase by exactly the same amount, the one may be lean, unfinished, and still a store, when the other is fat, and a butcher's animal. This is important, for it determines to a great extent the length of time required to fatten. If economic conditions warrant a short fattening period, the sooner the original purchase can be turned into prime beef the better business will it be. But the amount of live-weight increase which must be put on to a store before the animal will finish appears to be almost in inverse proportion to the initial live weight.

TABLE X.—*The Relationship of Store Weight and Finishing Weight.*

Store weight. cwt.	Average finishing weight. cwt.	Increase in weight cwt.	No. of bullocks.
6	9·7	3·7	6
7	9·8	2·8	48
8	10·8	2·8	78
9	11·1	2·1	33
10	11·5	1·5	1

Store weight cwt.	Number of bullocks expressed as per cent Finishing weights, cwt.					No of bullocks.
	9	10	11	12	13	
6	34	66	—	—	—	6
7	23	56	21	—	—	48
8	1	27	56	16	—	78
9	—	3	48	39	10	33

Correlation co-efficient + 730 ± 0·037.

It is without doubt much easier to finish an animal that has been done well from birth than one which has been reared on a lower plane of nutrition. Whereas it was necessary to add only 2·1 cwt. to the weight of the 9 cwt. stores, those of 7 cwt. required 2·8 cwt. more weight before they were ready for the butcher. Of course, there was no attempt made to produce baby beef, rather was it young beef finished around two years old that was the object in view.

According to these results it seems likely to be very difficult to turn out finished beef from a purchased store much before it reaches two years old. In effect this prevents the arable-land feeder from participating in the baby-beef trade. It seems useless to expect to finish a bought store much below 10 cwt. live-weight.

These results give no information concerning stores weighing less than 6 cwt., but if it is permissible to argue by inference, stores less than 6 cwt. live-weight would take longer to finish than heavier stores, would require the whole of the winter feeding period to fatten and would weigh over 9 cwt. when fit for the butcher. Undoubtedly the same animals treated as beeflings from birth would kill at a much smaller live weight than 9 cwt.

LENGTH OF FATTENING PERIOD.

The general rate of fattening has already been indicated. Further detail is given in Tables XI and XII, the latter showing the relation between length of fattening period and daily live-weight increase.

TABLE XI.—*Number of Weeks to Fatten.*

Number of bullocks expressed as percentage of 178.

Length of fattening period.	Per cent.
14–16 weeks—average 15 weeks	4
16–18 ,, ,, 17 ,,	4
18–20 ,, ,, 19 ,,	21
20–22 ,, ,, 21 ,,	34
22–24 ,, ,, 23 ,,	13
24–26 ,, ,, 25 ,,	15
26–28 ,, ,, 27 ,,	6
28–30 ,, ,, 29 ,,	—
30–32 ,, ,, 31 ,,	3

TABLE XII.—*Relationship between Number of Weeks to Finish and Daily Live-weight Increase.*

Live weight increase per head per day, lb.	No. of weeks to finish.	No. of bullocks.
1	28·0	1
1½	24·0	27
2	22·7	83
2½	20·4	43
3	20·0	8
3½	14·0	3

No. of weeks to finish.	Average live-weight increase per day.	No. of bullocks.
14	2·9	6
16	2·0	2
18	2·3	8
20	2·3	59
22	2·1	34
24	1·9	18
26	1·8	29
28	1·5	3
30	1·9	6

Correlation co-efficient - ·401 ± 0·065.

It will be observed that the majority of stores took longer than 20 weeks to fatten and that daily live-weight increase is correlated with length of time to finish. It seems that the animals which put on weight most quickly are those which attain finish most readily, though there is no relation between length of fattening period and *amount* of live-weight increase. This is illustrated in Table XIII.

TABLE XIII.—*Relationship between Number of Weeks to Fatten and* AMOUNT *of Live-weight Increase.*

Length of fattening period.	Live-weight increase, cwt.	No. of bullocks.
14	2·46	6
16	1·75	2
18	2·79	8
20	2·80	59
22	2·83	34
24	2·99	18
26	3·00	29
28	2·12	3
30	3·67	6

Correlation coefficient + ·062.

Referring to Table XII, it will be noted that cattle spending more than 20 weeks in the yards increased by less than 2½ lb. daily. This is interesting in view of the suggestion made by the late Prof. Wood that 2 lb. per day live-weight increase should be the object of scientific fattening. If the analysis of the Sprowston data has any general application, it would suggest that a higher daily performance than 2 lb. per day is required if the fattening period is to be no longer than 20 weeks. The difference between a 2 and 2½ lb. per day live-weight increase is responsible for approximately 2⅓ more weeks' fattening. Just over 3½ more weeks were required to fatten animals averaging only 1½ lb. per day in contrast with those averaging 2½ lb. The second half of Table XII shows how daily live-weight increases are correlated with fattening periods increasing successively by two weeks.

It has already been shown that the weight of the store has a profound effect upon the finishing weight. It has an equal effect upon the length of time taken to finish. This is illustrated by the following table :—

TABLE XIV.—*Relationship of Store Weight and Number of Weeks to Fatten.*

Store weight. cwt.	Average No. of weeks to fatten.	No. of bullocks.
6	26·5	6
7	23·0	47
8	22·8	78
9	19·8	33

Correlation coefficient −·309 ± 0·071.

It follows, of course, that the finishing weight and the number of days to fatten are also intimately connected. In fact, it is possible here to conclude that the heaviest of the store cattle finished in the shortest time, and increased by the greatest amount each day; and that the bullocks finishing in the shortest time were the heaviest at the finish, but did not necessarily put on the greatest total weight.

LIVE WEIGHT AND CARCASE WEIGHT.

Many of the bullocks were sold to Messrs. F. W. Algar & Son, of Norwich, whose great interest in the subject enabled us to obtain many carcase weights. They have been summarized in Table XV. according to the live weights when sold, and have been grouped to bring out any possible differences in carcase percentages at various killing weights. The percentages are of dead weight to unfasted live weight.

TABLE XV.—*Live Weight (Fat) and Percentage of Carcase to Live Weight.*

	Live weight fat. cwt	Average per cent carcase to live weight	No of bullocks
	8	55·3	3
	8½	54·0	9
	9	54·3	6
	9½	55·3	17
	10	54·9	34
	10½	54·8	30
	11	55·5	45
	11½	55·1	24
	12	55 6	13
	12½	55·4	5
	13	56·0	1
Average	10·55	55·2	Total 187

Correlation coefficient + 196 ± 0 070.

Thus there was no significant connection between the weight when fat and the percentage of dead to live weight.

A MORE SCIENTIFIC ASPECT OF THE FEEDING.

The development of the practice of compounding rations for stock according to figures which, based upon the analysis of the rations, are expected to produce a more or less fixed output, would be pointless unless it applied to what is usually spoken of as the average animal. Thus the weights of starch equivalent and digestible protein necessary to supply the maintenance requirement of a fattening bullock, and then to enable the animal to increase in weight by 2 lb. daily, as Wood suggested, should apply literally to the cattle fed in the Sprowston yards. They were average cattle, of the kind available to all feeders and were often bought, in competition with other feeders, on the open market.

We have already said that we failed to obtain the 2½ lb. expected daily from each bullock. We know by how much we failed. Thus there is no difficulty in calculating from the live-weight increase records and from the theoretical value of the food consumed, the actual quantities of starch equivalent and digestible protein which were necessary to obtain 1 lb. of daily live-weight gain. The result should then show how much less economical was our feeding than it should have been according to Wood's standards.

The theoretical feeding value of the rations in each year are given in Table XVI.

TABLE XVI.—*Composition of Average Daily Rations in Each Year.*

Year.	Dry Matter. lb.	Starch Equivalent. lb.	Protein Equivalent. lb.
1932	22·5	12·8	1·8
1931	23·6	13·4	1·6
1930	22·6	13·5	1·7
1929	20·0	13·6	1·7
1928	20·0	14·8	2·1
1927	21·7	13·7	1·8
1925	23·6	13·2	1·6
Average	21·9	13·6	1·7

Although Wood suggested 2 lb. of daily gain as a working basis in practice, he considered that greater increases were merely a question of feeding more food, making due allowance for increased maintenance and production requirements as the beasts fattened.[1] Hence, in spite of the slightly higher level of nutrition of the Sprowston feeding, it is quite permissible to take the average live-weight increase of all the bullocks at a specific weight, deduct the maintenance requirement from the total starch equivalent fed at that weight, and so obtain the amount of starch equivalent available for production. Then the quantity of starch equivalent actually required at different live-weight levels, to give 1 lb. live-weight gain, is easily calculated. The following table was used to make the calculation. It gives full particulars of the feeding.

TABLE XVII.—*Quantity of Dry Matter, Starch Equivalent and Protein Equivalent fed per Bullock per day at Stated Live Weights.*

Weight of bullocks. cwt.		Dry Matter. lb.	Starch Equivalent. lb.	Protein Equivalent. lb.	Live weight Increase per head per day. lb.
6½ - 7½	average 7	20·5	13·1	1·7	1·9
7½ - 8½	„ 8	21·1	13·1	1·7	2·2
8½ - 9½	„ 9	21·8	13·6	1·7	2·1
9½-10½	„ 10	22·9	14·0	1·7	2·1
10½-11½	„ 11	23·1	14·0	1·8	2·2

Deducting the appropriate maintenance requirements from the total starch equivalent, the production requirement per lb. of live-weight increase is 3·6 lb. for the 8 cwt., 9 cwt., and 10 cwt. bullocks. A corresponding figure for the 7 cwt. and 11 cwt. bullocks cannot be given owing to the small number of cattle in these groups. But a production requirement of 3·6 lb. of starch equivalent is considerably higher than the standards suggested by Wood, and it is possible that a higher maintenance requirement is needed for open-yard feeding. In three of the years it was possible to calculate the maintenance and production requirements from Wood's formula[1] $R = M + GK$. Over the whole period of fattening, the maintenance requirements in the three years were 6·9 lb., 8·0 lb., and 7·0 lb. of starch equivalent, and the corresponding production requirements were 3·0 lb., 3·0 lb. and 2·5 lb. of starch equivalent respectively.

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[1] Compare, however, J. A. S. Watson. *Journal of the Farmers' Club*, December, 1930.

It is impossible to account definitely for the divergence from Wood's standards, but it is very probably due to the influence of factors peculiar to open-yard feeding. One is left wondering whether the maintenance or production standards suggested by Wood are too low for open-yard feeding, though there is no reason to think that his protein standards need revision.[2]

The results indicate that it is reasonable to urge feeders to consider a higher daily live-weight increase standard than 2 lb. per day. Such a procedure should obviously increase the daily live-weight gain, and reduce the length of the fattening period; and it might reduce the proportion of "tail" cattle which seem to drag on much longer, when on a comparatively low plane of nutrition. If 2½ lb. per day is attempted there is ample evidence to show that a good class of bullock will respond to it, while those of inferior calibre would still attain a 2-lb. level with reasonable frequency.

This extra ½ lb. of live-weight increase could be obtained by the feeding of approximately an extra 1½ lb. of starch equivalent, which would be contained in 2½ lb. of maize meal. With maize meal at £6 per ton this would increase the cost of the ration by 9*d.* per week per bullock, or 9*s.* over the fattening period of 20 weeks. If it reduced the fattening period by no more than one week, the additional outlay would be recovered. According to the results indicated earlier, the extra live-weight increase of ½ lb. per day would reduce the fattening period by 2½ weeks.

SUMMARY.

1. The weighbridge records of 173 bullocks fattened at the Norfolk Agricultural Station have been examined statistically. The records were selected from those of some 400 cattle fed in the past eight years, and exclude all bullocks fed on

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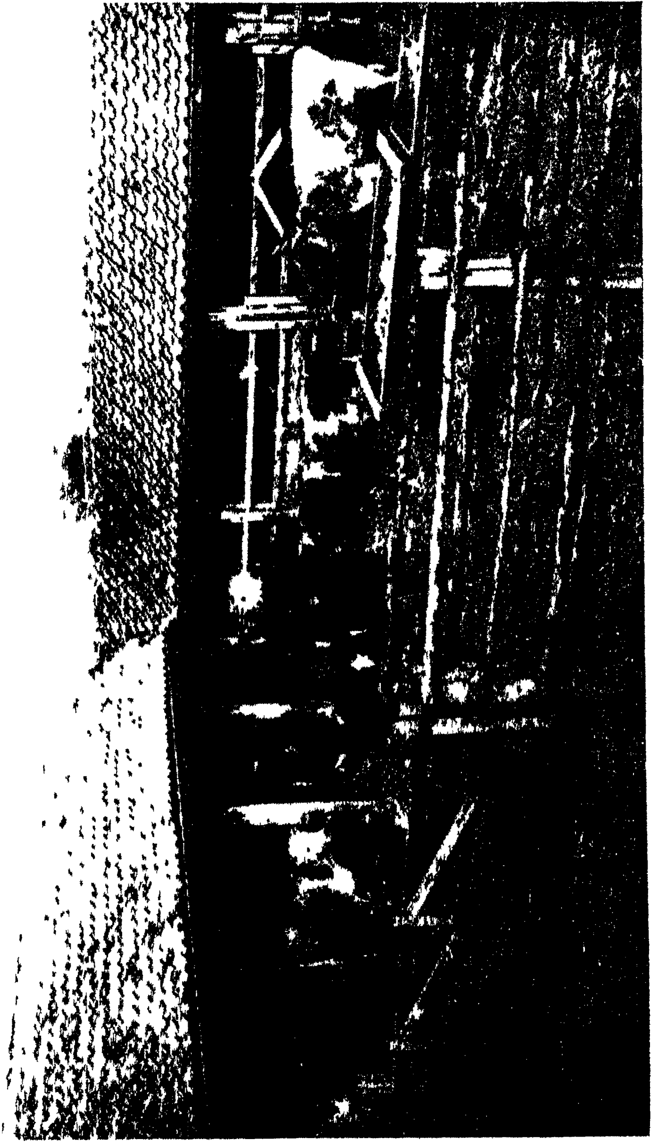
[1] T. B. Wood. *Journal of the Ministry of Agriculture.* November, 1927.

[2] S. T. Johnson. *An Experiment on the Feeding of Bullocks in Yards. R.A.S.E. Journal,* 1927. The feeding of extra digestible protein, in amounts exceeding Wood's standard to the extent of sixty or one hundred per cent., had no effect on the live-weight increases of fattening bullocks.



A general view of Norfolk semi-covered fattening yard.
Cumberland Shorthorns during fattening.

experimental rations which might have been expected to interfere with the normal progress of fattening.

2. The cattle were housed in semi-covered yards, typical of the Norfolk system of yard feeding, and were therefore more exposed to the weather than stall- or box-fed animals. Stores were purchased in October weighing about 8 cwt. and brought into the yards almost immediately.

3. Rations were fed calculated to produce 2½ lb. of live-weight increase daily according to the tables given in Wood's "Rations for Livestock" (*Ministry of Agriculture Bulletin No.* 48).

4. The average daily live-weight increase was 2·1 lb. per head, nearly ½ lb. per day less than was anticipated; the cattle took on the average 22 weeks to fatten.

5. The lowest live-weight gains were recorded in the first and third months of fattening. The daily live-weight gains were more uniform in the later than the earlier stages of fattening.

6. Considering the yards as a whole, the following relationships were found :—

(*a*) The smaller stores took longer to fatten and required more increase in weight than the larger stores. The 7-cwt. stores, for example, increased in weight 2·8 cwt. before being fit to kill, while 9-cwt. stores were finished after gaining 2·1 cwt.

(*b*) High daily live-weight increases were associated with a short period of fattening.

(*c*) Store weight was related to the number of weeks required to fatten, *i.e.* the heavier stores fattened more quickly than the lighter stores.

(*d*) The heavier stores were the heavier when fat.

(*e*) The bullocks which were heaviest at the finish recorded the greatest daily live-weight increases while fattening.

(*f*) The weight of the store had little influence on the daily live-weight gain.

7. There was no significant relation between the fat live weight and the percentage of carcase weight to live weight.

8. The results indicate that it would be advisable to consider a higher standard of live-weight increase than the 2 lb. per day suggested by Wood. If 2½ lb. per day were attempted, there is evidence that the fattening period would be shortened, the extra cost of the food in terms of maize meal being 9*s.* per bullock for 20 weeks' fattening.

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NOTABLE FARMING ENTERPRISES: IV.

I.—A COMMERCIAL EXPERIMENT IN POULTRY FARMING.

IN recent years considerable interest has been aroused by the development of a number of systems of poultry-keeping which, although in many instances they have been labelled with the name of the inventor of a particular type of house, may be collectively referred to as the movable pen or "folding" system.

The folding system, which in its simplest form consists of a coop or house attached to a wired-in run, appears to have been invented independently and sporadically at a number of farms in the past, and to have been used in the first instance for the rearing of young pheasants. A similar method for running various breeds of rabbit on grass land had some popularity for a time under the name of the "Morant" system, and is still in use in a modified form at a few centres. In each of these two cases the primary object seems to have been the avoidance of disease, made possible by moving the stock daily on to clean ground. The method, from this point of view, seems to have been reasonably successful.

The first commercial application of a movable-pen system for the housing of an egg-laying flock seems to be fairly generally ascribed to Messrs. Motley, of Stockbridge, who have developed a number of types which have found their way into many parts of the country, and which are now too well known to require description. Another unit of a modified apex construction was evolved a little later by Mr. A. J. Hosier, of Wexcombe Manor, and has been used with some success as one of the many innovations in farm practice with which the windswept Wexcombe Downs have been so strikingly associated.

In both these instances the main objects have been threefold: to provide a poultry unit which would compete in cost with either "intensive" or "semi-intensive" fixed houses, or with movable "slatted-floor" field houses: to provide a unit which would maintain a commercial laying flock in good condition under somewhat exposed conditions, with a minimum of labour: and to provide a unit which could be moved daily, in order to secure an evenly applied treatment to the turf, with a view to its improvement.

That these three objects have been to a very large extent attained would seem to be fairly evident from the results of the last few seasons, and from the very large number of units produced by other makers in the last eighteen months. These reproduce, to quite a remarkable degree, the main points of design of one or the other of the two early types.

There is still, however, a very large field open to the designer, and it is proposed in this paper to discuss the working of yet a third type of house, designed for more protected conditions, as exemplified in the full-scale experimental lay-out of Mr. A. Arbuthnot, of Sinah Warren, Hayling Island.

It is debatable whether this falls properly under the heading of notable farming enterprises. Conceived originally as a bold experiment to prove that birds could be carried as cheaply and as successfully on a large-scale movable fold lay-out as on any other system, and in the second place to prove that commercial egg production and sale might, even in the present condition of trade, be made a profitable occupation, the experiment was discontinued when these points had been proved, and the organization was handed over to others to continue as a commercial venture ; the staff and plant are at present involved in a further experiment on the large-scale production of table birds.

In 1930, at a time when Mr. Arbuthnot was running a commercial egg farm based on two large intensive houses of 4,500 square feet each, he conceived the idea of making a movable pen unit which could be run on his spare grassland at Hayling Island. He had apparently been stimulated to the idea by memories of a small run of this kind which he had seen used for pheasants in 1889, and in 1922 had built a large combined house and run, to take 100 birds, which required the combined efforts of eight men for its daily move.

After a number of abortive experiments a good design[1] was evolved, and in April 1930 six houses were built of a pattern described below which, with only minor modifications, is still in use. This is a combined slatted-floor house and run, 8 × 20 feet, *i.e.* covering 160 square feet, intended to house 35 birds. The cost varied between 90*s.* and 120*s.*, depending on the cost at which the material could be purchased, the labour charges being of the order of 40*s.* upward per house and the actual material costing from 50*s.* upward.

These six houses proved successful, as far as concerned the health of the stock and their laying capacity, and plans were at once put in hand for a full-scale experiment of 7,000 laying birds, together with the brooding plant necessary to produce these from purchased day-old chicks ; the old intensive houses were converted into workshops and stores.

It may be of some interest at this juncture to give the estimate on which the venture was based.

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[1] Blue prints of this unit may be obtained for a nominal sum from the Institute for Research in Agricultural Engineering, University of Oxford.

ESTIMATE FOR 7,000-HEN FARM, HAYLING ISLAND.

Capital outlay.	£
7,000 pullets @ 6*s.*	2,100
200 houses @ 90*s.*	900
4 sheds @ 140*s.*	28
1 caravan (for men)	20
Miscellaneous small items	20
	£3,068

Depreciation per annum.	
Birds, 2*s.* a year (for 2 years: birds sold for 2*s.* in third year)	700
Houses (five-year life)	180
Sheds, £2 each per annum	8
Caravan, £5 per annum	5
Smalls, @ 100 per cent.	20
	£913

Annual Outgoings.	
Food, 4 oz. per bird-day @ £8 10*s.* per ton	2,423
Wages: 2 men, 2 labourers, woman for egg washing, etc.	512
Rent	70
Carriage of eggs, etc.	50
Carpenter	78
Materials, timber, etc.	40
	£3,173
Add: Depreciation as above	913
Add: 5 per cent. interest on capital	153
	£4,239
Annual Incomings.	
Sale of eggs: average 160 per bird at average price of 1*s.* 1½*d.* per doz.	£5,250
Estimated profit	£1,011

These forecasted figures have been, naturally, falsified by results. As regards capital outlay, the price for pullets has been materially less than 6*s.*, since the birds have been raised on the farm at a lower cost: it has, unfortunately, in view of complications introduced by the production of cockerels for table birds, not been possible to obtain an accurate figure. The houses, on the average of two 7,000–8,000–bird farms of 200 units each, have, owing to rising prices of material and modifications involving extra labour, worked out at just under £6 each. It was found preferable to substitute one large shed at

£17 for the four small sheds, and the caravan was discarded. The depreciation of small items at 100 per cent. was unnecessarily pessimistic.

Of the Annual Outgoings food has worked out, on the average, through purchasing in bulk, at £6 12*s.* 6*d.* per ton, and the labour bill has been reduced by dispensing with the services of the woman for egg washing, which was done by the men for the small proportion of the eggs which required it. Up to the present there has been no occasion for the services of a carpenter, except in the case of occasional damage caused in moving houses over some distance, and for modifications in design; this item, as well as that for materials, might be written down to less than one-tenth of the estimated figure. The question of depreciation and repairs is more involved. After three years the houses give no indication of unduly rapid wear or disintegration, and in a general overhaul it was found that, for houses which had been in continual use for from two to three years, the only attention required was the tightening of a few bolts and the recreosoting of the members which had been in contact with the ground. It would appear that the effective life of the houses, subject to periodic overhaul, would be nearer ten years than five.

As regards incomings, both the average production per bird—which worked out at 179·2—and the average price realized were higher than was originally anticipated, and sales of eggs alone for the year 1931 exceeded £6,000. In addition to this, good prices were realized for table birds and "boilers," which upset the normal depreciation figures considerably. In this connection it may be noted that in 1933 a very large number of two- and three-year-old birds found a ready sale as "broodies" for pheasant rearing at a price of 4*s.* 6*d.* each. This should not, however, be taken as indicating that the system favours broodiness, which is readily dealt with when it occurs under normal conditions, but which, when encouraged, provided an excellent means of obtaining a price higher than the normal. The chief weakness of the forecasted estimate was that it made no allowance for the replacement of casualties due to disease, ruptured oviducts and the like. These from all sources appear, as far as figures could be obtained, to have been of the order of 7½ per cent. Birds culled for any reason were transferred to the table bird experimental unit, and detailed figures for these and for casualties are not available. Reconstructing what must be unfortunately a purely imaginary balance sheet on the basis of these modifications, the following figures are obtained. (No details are given for replacement of casualties and culls, nor for sales of the latter, since any adverse balance is covered by the excessive charge of 6*s.* for stock.)

ESTIMATED PRESENT COST OF 7,000-BIRD FARM ON MOVABLE-PEN SYSTEM.

Capital Outlay.	£
7,000 pullets @ 6s. (retaining this figure as that of commercial stock)	2,100
200 houses @ 120s.	1,200
1 shed @	20
Miscellaneous small items	20
	£3,340
Depreciation.	
Birds	700
Houses @ 10 years	120
Shed @ 10 years	2
Smalls @ 4 years	4
	£826
Annual Outgoings.	
Food: 4 oz. per bird-day @ £6 12*s.* 6*d.*	1,889
Wages @ £9 10*s.* per week	494
Rent	70
Carriage of eggs	50
Carpenter and materials for repairs and creosoting, say	60
	£2,563
Add: Depreciation	826
Add: 5 per cent. interest on capital	167
Total	£3,556
Annual Incomings.	
Sale of eggs	6,000
Estimated profit	£2,444

SELLING ORGANIZATION.

One of the main problems facing the average poultry farmer is that of the profitable disposal of his produce. Most farms are dependent largely or entirely on the services of an egg-grading and packing station, working, in the majority of cases, under the National Mark Scheme in connection with the Egg Central in London, although a number of independent organizations exist which collect and grade eggs on a wholesale basis.

In the case of a National Mark Station, which may be taken as a typical example, suppliers are paid for their eggs at the wholesale prices published by the National Mark Central, less a deduction of the order of 1*s.* 6*d.* per long hundred (ten dozen) for grading and candling. The cost varies according to the locality and other circumstances, but in general means a deduction of 1½*d.* to 2*d.* per dozen off the National Mark wholesale prices, not including further deductions for faults revealed by candling; some of these latter, such as large blood spots, render the egg unsuitable for domestic use, while others, such as hair cracks, unfit the eggs for a delay before sale to the eventual consumer, but do not spoil them for immediate use.

It is a traditional belief among retailers that it is impossible, with any prospect of success, to devote a shop to the selling of eggs alone, and that to make a profit the sales must be extended to cover dairy products, packet goods and the like. The selling arrangements made by Mr. Arbuthnot form a complete break from this tradition. A small shop was taken in a shopping centre in one of the most populous districts of Portsmouth, at a rental of £150 per annum, and devoted solely to the sale of eggs. After redecoration, at a cost of £33, the back part of the shop was fitted up as a receiving and grading depot, and two women assistants were engaged at wages of 35*s.* and 30*s.* per week respectively. The eggs, received in 30-doz. cases, were unloaded on to Raylite trays, graded into the National Mark grades (special 2¼ oz., standard 2 oz., medium 1¾ oz., pullets 1½ oz.) and after candling for gross defects, packed for counter sale in 1 doz. cartons, all transactions being for cash, and no deliveries being undertaken. This venture proved an immediate success, and the Hayling Island graded eggs rapidly commanded a premium over ungraded eggs exposed for sale in the same street by other and less specialized establishments. The freehold of this shop was eventually purchased for £1,800, and in the meantime a second shop was acquired for £1,798 freehold. Since that time it has become necessary to acquire a third and a fourth shop, and the original receiving and grading depot, which was of inadequate capacity, was transferred to a separate establishment to serve all four shops. In the first year of the venture, the net selling cost worked out at ·82*d.* per dozen eggs sold. To give some indication of the prices obtained by this method of direct retail selling the figures for 1932–33 may be compared with the National Mark wholesale figures reduced to price per dozen. The latter figures are, of course, appreciably higher than local wholesale prices for ungraded eggs, and it should be noted that during the glut months of April and May, ungraded local eggs were selling retail at prices below 8*d.* per dozen.

A comparison of the average prices for the two grades shows that graded eggs can be sold retail for approximately 2*d.* per doz. more than the National Mark wholesale price, allowing for purely local fluctuations of demand and supply. Since, after allowing for deductions, the producer who supplies a registered grading station receives 2*d.* a dozen less, on the average, than

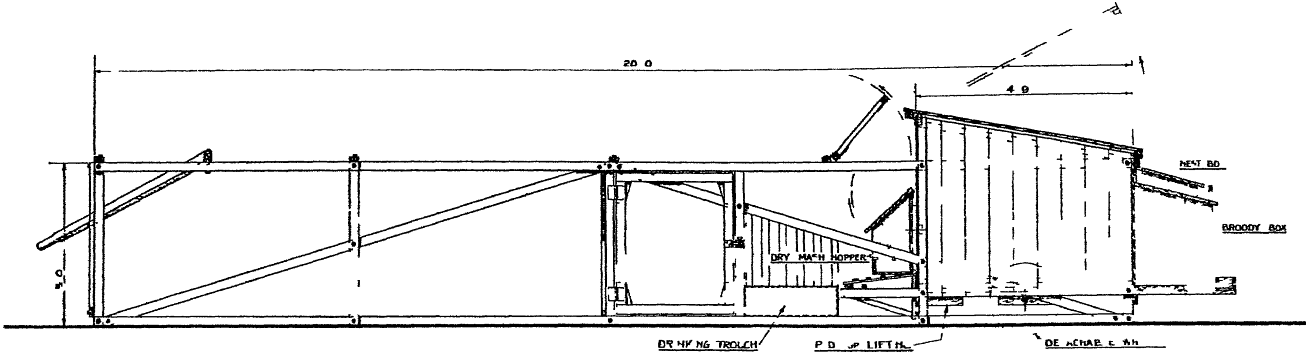
	Retail price at shops		National Mark wholesale prices.	
	Specials 2¼ oz	Standards 2 oz.	Specials 2¼ oz	Standards 2 oz.
	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
1932. Oct.	2 2 —2 6	1 11 —2 3	1 9½—2 5	1 9 —2 3
Nov.	2 6 —2 11	2 3 —2 8	2 2½—2 6	1 11 —1 11
Dec.	2 4 —2 6	2 0 —2 3	2 1 —2 2½	1 8½—1 9½
1933. Jan.	1 11 —2 3	1 7 —2 1	1 5 —1 8	1 4 —1 6½
Feb.	1 5 —1 9½	1 4 —1 8½	1 5½—1 9	1 5 —1 8½
Mar.	1 1 —1 5	1 0 —1 4	0 11½—1 3	0 11 —1 0½
Apr.	1 0 —1 1	0 11 —1 0	0 11½—1 1	0 10 —0 11½
May	1 0½—1 2	0 11½—1 1	0 11½—1 1	1 0 —1 3
June	1 2 —1 4¾	1 1 —1 3½	1 1 —1 5	1 1 —1 4
July	1 4¾—1 6½	1 3½—1 5	1 2½—1 5½	1 3½—1 9
Aug.	1 6½—1 11	1 5 —1 9¾	1 5½—1 11	
Sept.	1 11 —1 11	1 8½—1 9¼		
Average for year, unweighted	1 7½—1 10½	1 5½—1 8⅝	1 5⅜—1 8⅝	1 3¾—1 6⅜

the National Mark prices, and, if the cost of selling through a shop is taken at 1*d*. per dozen, there is a clear gain, with this means of disposal, of 3*d*. per dozen. For a 7,000 bird flock averaging 168 eggs per annum, this would amount in a year to £1,225, and for a flock average of 180 to £1,312 10*s*. 0*d*. In the last two years the sales of the shops have been considerably augmented by the disposal of table birds and boilers —usually " culls "—and latterly packet tea has been sold as well, at the request of customers. These items, however, are of purely subsidiary importance, and the shops could still show a handsome profit on the sale of eggs alone.

Towards the end of 1931 it was becoming evident that the capacity of Portsmouth to consume new-laid graded eggs was far in excess of the possible production of one farm, and Mr. Arbuthnot decided to form a small co-operative society of a limited number of local egg producers, which was duly registered in February 1932 under the auspices of the N.F.U. In the last few months Mr. Arbuthnot has transferred all his interests in the egg-retailing businesses to the other members of this society in order to leave his hands and equipment free for other experiments, and has, for the time being at least, closed down one 7,000-bird unit and transferred the other to one of the members of the co-operative society.

THE MOVABLE PEN AND SUBSIDIARY EQUIPMENT.

The main features of the house are shown in the elevation drawing on p. 90. Each house consists of two side-girder members or longerons, properly triangulated to withstand the



Hayling Island Movable Pen. Elevation.

stresses of lifting and moving, and the irregularities of the ground. These are connected at each end by cross members and diagonal struts. The rectangular box frame thus formed is further stiffened by a pair of diagonal braces in the centre of the run, and by the framework and sides of the slatted floor sleeping compartment, which measures 8 feet × 4 feet 9 inches overall. This end of the house is further strengthened by diagonal cross members. The run proper, below the slatted floor, after allowing for the mash hopper and feeding platform, measures 8 feet × 13 feet 6 inches, with an area of 108 square feet, or just over 2½ square feet per bird, allowing 40 to the house. All frame members are of 2 × 1 inch deal, with the exception of the lifting handles—which form a diagonal corner bracing—and one cross member at the rear of the house supporting the nest boxes and broody coops, which are of 2 × 2 inch and the diagonal bracing in the centre of the run, which is of 1 × 1 inch. All joints which are called on to take any stresses are bolted (a very important feature of the design of any house of this type) and there are no dovetailed or morticed joints. An attendant's door is fitted at one side, and a flap giving access to the dry-mash hopper in the top of the run. In the case of each of these doors, the corners are held by metal gusset plates screwed to the wood frame, a much stronger and cheaper method of construction than a morticed joint.

The dry mash hopper is 6 feet 8½ inches long, with an overhanging sloping lid covered with bituminous felt, and has a grit compartment 6 inches long. The hopper runs the full width of the house except for the entrance trap at one side, which can be closed by a conventional type of sliding flap.

The sleeping compartment has a slatted floor in three removable sections. These can readily be removed, for cleaning, through the centre section of the roof, which is hinged to the front of the house and which conveniently exposes the whole of the interior for disinfection should the house become infested, *e.g.* with red mite, though trouble from this source is so far unknown. In the original design the back of the house was fitted with two removable panels, in place of which broody coops and nest boxes could be fitted, to allow the house to be used for running on young stock or cockerels. Nest boxes—fitted with a grid which can be lowered to prevent birds roosting in the boxes and fouling them—are now built in, consisting of four compartments, arranged two deep, each 2 feet 6 inches × 1 foot, giving room for up to sixteen birds. These could readily be converted for trap nesting if required. The broody-coop, conveniently to hand, has three compartments 1 foot 6 inches × 1 foot, with a slatted floor: it has its own feeding trough, protected by an overhanging roof and sides, and could, if necessary, be used as a cockerel box.

Beneath the sleeping compartment, at a point where the horizontal members carrying the sides of the house cross the diagonals of the main longerons, a tubular steel axle is fitted, fixed in two housings of 2×2 inch timber. This axle (whose position has been so arranged as not to come below the centre of gravity of the whole unit, but so far in front as to impose a definite weight on the lifting handles) projects 6 inches, and is drilled for pins to retain the wheels in position when moving the houses.

The whole of the sides and top of the run is covered with well stretched 3-inch mesh 19 s.w.g. wire netting. This contributes little, if anything, to the strength of the structure, and might well be replaced by a smaller mesh in order to avoid robbing and contamination of the mash by birds and vermin, though this is negligible at Hayling Island.

The original watering arrangements for the houses consisted of air-lock bucket fountains placed inside the run. These were found wasteful in the amount of time required to refill and replace them, difficult to keep clean, and difficult to free from ice in winter. They have since been replaced by an external trough, at the side of the run, which can quickly be filled by a flexible hose from a tank carried on the service trolley.

The construction of all these houses was done on mass production lines. All materials were cut to length and jointed on jigs, and special jigs were arranged for the assembly of such units as the longerons, slatted floors, door frames and the like, reducing the labour costs to a very small figure: and all parts before assembly were creosoted by immersion.

MOVING ARRANGEMENTS.

After a number of experiments it was found that solid built-up wooden wheels were lighter and more economical than wrought or cast-iron wheels, and required less tractive effort than any "caterpillar" attachment. Lightness in weight is essential since in a 200-house unit the distance the wheels are carried between moves adds up to a considerable figure, and with convenience in view, a carrying handle is fitted to each wheel.

The method of attaching the wheels is elementary; a wooden lever or handspike is placed under each side of the house in turn—a bearing pad for the purpose obviating undue wear and tear on the structure—and while the weight of the house is held with one hand, the wheel is slipped on to the axle with the other. A 3-inch nail dropped through the hole in the axle prevents the wheel—which is bushed with iron tubing—from slipping off during the move. Although a labourer can move the houses single handed, it is found more economical to use two men for the work, which is done at the same time as filling up mash hoppers and watering. Moving alone takes one minute per house with two men, or four minutes single handed.

For moving longer distances in the laying field, a pair of pneumatic-tyred wheels (steel detachable wheels from a light car, rebushed) of somewhat larger diameter are employed, and for moving by road, as from farm to farm, a specially constructed trailer carriage to go behind a car or lorry. This carriage has a pair of pneumatic wheels, tracking 6 feet 6 inches, with springs (coming within the sides of the run) and a light triangular chassis of timber. The house is lifted bodily on to the chassis, the operation requiring five men. As an example of the speed of transit, a recent move over a mile of road, with two difficult field entrances involving some backing, and with about a quarter of a mile over grassland and tracks, averaged 20 minutes per house for 200 houses, or slightly over a week for the complete equipment of an 8,000-bird farm.

It has been noted that the Hayling Island house has been designed to suit the special conditions of the Island, as the Hosier house has been designed to work under the more exposed conditions of the Wiltshire Downs. It has been found necessary, however, to provide protection during the summer months against excessive insolation. This has been done by the use of creosoted hessian sheets, 6 × 13 feet, tied to the top of the run by eyelets, and provided with 8 feet battens in the centre of each side to prevent them flapping in the wind.

For more exposed positions it should be possible to provide these houses with lateral protection. This has been very successfully done in one of the Motley houses by means of thin metal sheeting attached to the sides by turnbuckles.

A further point worthy of notice is that these houses have not been designed, as has the Hosier unit, for use in the same fields as stock. They have, however, been run at Hayling Island with cattle, and at Kidlington with sheep, without apparent interference or damage. Further experience on this question is, however, desirable.

BROODING EQUIPMENT.

As all the birds for the movable units were raised from day-old chicks on the farm, the brooder houses, which possess a number of unusual features, merit description. The original lay-out consisted of 12 brooder houses, each 80 × 15 feet, containing 9 compartments each and a central food store.

The houses are timber framed and clad inside and out with asbestos cement sheeting cemented at all edges with bituminous compound ; they run east and west, and are raised 3 feet from the ground on concrete blocks cast *in situ.* The roofs are timber, covered with asbestos felt and lined with asbestos cement sheeting ; baffled eaves ventilation is fitted on the north side only. The windows present a point of some interest in that the lights are single steel frames, but otherwise are of conventional arrangement. Each house has a corridor running the full length of the north side and provided with a door at each end. The wired off compartments are each provided with an electrically heated hover, made on the estate, which consists of a 90° galvanized iron cone supported on three iron legs, and fitted inside with an electric heating unit consisting of three woven resistance mats mounted on asbestos cement sheet. These resistance mats are controlled by two tumbler switches on the outside of the metal cone and so wired that one, two or all three mats can be switched into circuit.

Each brooder house is fitted with electric light and independent switching, and also with a 36-hour clockwork time-switch of a cheap pattern, which is used to give the chicks artificial light for several hours during the night in order to encourage them to feed. The houses are at the moment being fitted with an automatic water-supply worked by a rubber ball valve of simple construction. The cost of each house, complete with all equipment, is just under £100.

As the available ground in the neighbourhood of the brooding plant has become contaminated in the last few years it is now inadvisable to pass young birds direct from the houses to movable pens as was done in the first two years. Nine additional " carry-on " houses of the same size and construction have therefore been erected. These are unlined, and consist of two large compartments with a door at each end and a central food store with a door at the side of the house. The internal arrangements—which include electric lighting and time switching—are like those of the ordinary intensive house without nest boxes. An elevated slatted-floor roosting bench is fitted on the north side, hinged to allow the collection of excreta from the dropping boards, and one window in each house is fitted with a hinged wire frame to allow the manure to be delivered into a trolley outside.

As an example of the thoroughness with which details are studied it may be noted that all houses are connected by raised concrete paths, and that the whole block is connected with the main food store and the road serving the farm by Decauville track.

FATTENING OF TABLE BIRDS.

Since last spring the farm has been engaged on an increasing scale in supplying "Surrey Fowl" for the London market. The fattening department consists of a converted intensive laying house 156×30 feet, of timber construction, containing 32 double-sided, double-deck fattening cages, each consisting of 16 compartments, 3 feet× 1 foot 6 inches×1 foot 6 inches, with a total capacity of over 3,000 birds. The birds are trough fed for a fortnight on a mixture of Sussex oats, dried skim milk and fat (from the second week) and are finished in the third week by hand cramming.

Plucking, stubbing and packing is done in an adjoining shed. The plucking is done with two "comb" mechanical pluckers, and the stubbing is done by hand. Incidentally, the latter is done in a compartment entirely enclosed in mosquito netting in order to prevent the ingress of blow flies while preserving as full ventilation as possible. The poultry, after dressing, are stored in a refrigerated chamber at 42°F., it having been found that lower temperatures destroy the "bloom" on the carcase.

HEALTH OF THE STOCK.

Returning to the movable pens, it might be expected that under the conditions of close confinement, when 35 or 40 birds are kept together in an area of 100 square feet, trouble from contagious or infectious disease would be intensified. This, in practice, has not proved to be so, although if disease should occur the isolation of the birds in small units would prevent the attack from spreading to the whole flock. At Hayling Island, adult coccidiosis and caecal worms, due to running birds too long on the same ground, have been the most prevalent complaints. There have been a few sporadic cases of fowl paralysis. At Kidlington a few cases of contagious catarrh—which reached a high percentage in a field house flock on free range last season—have occurred in the movable pens, but the removal of infected birds as soon as symptoms were observed proved a complete check.

The suggestion is sometimes made that cannibalism and feather picking are likely to be accentuated by the confinement of folding runs. This does not seem to be the case if the birds are fed on a properly balanced ration, and the few and apparently sporadic cases which have occurred at Hayling Island have been chiefly among culls placed in broody hutches and awaiting removal. In other farms in the neighbourhood, using the same pens, this vice has not occurred.

As regards vermin conditions, at Hayling Island these are good, trouble from this source having been negligible. At Kidlington, where the conditions are adverse, it has been found that, so long as the pens are moved daily, they are not visited by rats, but if left for two days there is employment for a terrier when the houses are moved. Foxes do not attack the birds in the runs, and for some weeks a dozen units have been within a stone's throw of an occupied earth. It would, however, be advisable to protect external watering troughs and broody coops with a wire netting guard, particularly during the breeding season.

EFFECTS ON GRASSLAND OF MOVABLE RUNS.

It has been stated earlier in this note that one of the main reasons for the rapid spread of the movable-pen system has been the beneficial effect which it produces on grassland. Since at Hayling Island the primary object of these houses has been egg production, little or no attempt has been made to take advantage of the intensive manuring and scratching out of the herbage other than by haying the fields as crops have become available. The following remarks have therefore been supplemented by observations of Hosier houses at Wexcombe, and of both the Hosier and Hayland Island houses on the writer's own farm at Kidlington.

It is generally regarded as good practice to move these houses daily, but on the heavy land of Hayling Island, with clay subsoil, it has recently been found advantageous to move the houses only every second day. The scratching out of the herbage is thus more vigorous and more uniform in character, tussocks of every kind being thoroughly disintegrated. Much could be written on the question of the number of passages per year which the ground will stand. At Wexcombe, the acreage of available ground is very large, and the normal practice is to give it the "once over" only. At Hayling Island available space is limited, and the houses have to be run backwards and forwards repeatedly. Continuous treatment of this sort eventually results in the land becoming "poultry sick" and contaminated with caecal worms and coccidiosis, when it must be left untouched for one or more seasons. Herbage on land which has been very heavily and repeatedly folded shows all the symptoms of excess nitrogen and acidity, with a "sour mat" formation which can be best paralleled by the sulphate of ammonia grass plots at Rothamsted. This condition, however, unlike the true "sour mat," tends to disappear spontaneously at Hayling Island even in the absence of adequate calcium reserves in the soil. At Kidlington, where the predominating grass is cocksfoot, the "sour mat" persists unless broken down by grazing or harrowing.

It is perhaps advisable at this point to raise the question of the number of birds which can be kept to the acre under this system. The overall measurement of a Hayling Island movable pen is 8 × 20 feet, of which 8 feet × 4 feet 9 inches represents the slatted floor sleeping compartment. Each pen thus occupies 160 square feet and as an acre contains 43,560 square feet, it would be covered by some 272 houses. The period of rotation, and the number of birds to the acre, with either 35 or 40 birds per house, is given in the following table (approximate) :—

12 houses	420–480 birds	22 days
10 ,,	350–400 ,,	27 ,,
8 ,,	280–320 ,,	34 ,,
6 ,,	210–240 ,,	45 ,,
5 ,,	175–200 ,,	54 ,,
4 ,,	150–160 ,,	68 ,,
3 ,,	105–120 ,,	91 ,,
2 ,,	70– 80 ,,	136 ,,
1 house	35– 40 ,,	272 ,,

For a rotation of one year, approximately 15 houses are the allocation for 20 acres.

The average number at Hayling Island during the two past years has been of the order of 320 birds to the acre, giving a rotation of 34 days, but another farmer in the same area is running a flock of 8,000 birds on 25 acres, and is proposing to do this for two years before taking a hay crop.

From results on low lying meadows at Kidlington during the past two years it would appear definitely inadvisable to work to any fixed rotation throughout the year. The recovery of the herbage is closely governed by seasonal conditions and by the amount of rainfall, and while in the flush season the herbage may show a complete recovery six days after the pen has passed over it, during the winter months it may be two months or more before the sward is properly healed. In very dry weather during the spring and summer, the effect of the nitrogenous dressing[1] is sufficient to kill off all leaf surface which is not grazed. Freshly deposited poultry manure is slightly acid (pH 6·3), but in a short time, with fermentation and the liberation of ammonia, becomes strongly alkaline (pH 9·0), which accounts for this temporary toxicity.

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[1] 1,000 birds deposit 3 tons per month : 272 houses of 40 birds, which cover an acre, would deposit on this basis 10·9 cwt. per day, so that if the birds are moved every other day the herbage receives a dressing of over 1 ton per acre every time the houses pass over it.

A typical analysis of poultry manure is : Moisture 59·5, Dry Matter 40·5, Nitrogen 1·75, Phosphoric acid 1·00, Potash 0·54 (Ministry of Agriculture's leaflet No. 140, "Poultry Manure").

To take full advantage of the flush of growth produced by this manuring involves either grazing with sheep or cattle, or else the taking of a crop of hay: a third alternative, which has lately received some attention, would be to cut, collect and dry the new herbage while still in the "young grass" stage. Any of these methods would involve the resting of the herbage for a longer or shorter period, and any properly worked out scheme for using the movable pen as part of the farming system should make provision for this. At the same time, where the primary object is egg production, it should be recognized that it is virtually impossible to keep the herbage in good condition unless either grazing or mowing is practised, together with systematic dressing with carbonate of lime or basic slag so as to prevent undue accumulation of nitrogen in the soil and to redress the phosphatic deficiency of the manure.

One of the most interesting effects of the system is its action on the wild white clover present in the herbage. At Wexcombe, the passage of the Hosier unit is followed by a strong growth of white clover, particularly along the strips where the ground has been manured by the sleeping compartment but not "scratched". At Hayling Island, on the fields first used, there is now a good growth of clover, while on the fields used this season the growth has apparently been reduced. It is obvious that a complex of effects is involved. At Kidlington, moderate use increases clover, excessive use results in such strong growth of the finer grasses that the clover is apparently crowded out, but rapidly colonizes bare patches. White clover requires an adequate lime supply—present at Wexcombe and Kidlington, absent on Hayling Island—but can flourish without it in the presence of the nodule organism. It is sensitive to repeated defoliation. In the early days at Hayling Island the houses were moved daily, and in the latter period, only every other day; the use of forty birds per house in place of thirty-five is also a recent change.

It is somewhat surprising to find that in general the passage of the movable pens produces a decrease in the coarser or tussocky grasses and an increase in the finer at all three places. Under the conditions of the average poultry farm on the semi-intensive or free range system there is always a tendency for the tussocky grasses, such as cocksfoot, to increase unduly till, in the extreme case, the pasture consists of isolated islands of cocksfoot, with a few of the coarser-growing weeds such as thistles and docks, with intervening patches or tracks of bare earth. With the movable pens, one day's treatment by scratching is not always sufficient to destroy a cocksfoot tussock, particularly late in the season, but two days will disintegrate it; and though it will invariably reappear as one or more strong shoots, the growth is so lush that it is readily and immediately grazed.

Observation of the fowls at work on a new strip of grass tends to show that their first object is to uncover insect life. At intervals in the day, however, the whole pen will take to grass eating, and it would almost seem that there is some discrimination between palatable and unpalatable grasses. Yorkshire fog appears palatable, as does foxtail, in preference to cocksfoot; timothy in preference to bent; perennial rye grass to meadow fescue: at the end of the day, however, there is little for the birds to choose between, and at the end of two days they will rapidly and indiscriminately devour any mixture of cut grasses which is dropped in the run.

If it can be confirmed that birds kept under these conditions can exercise a specific action on the grasses in a sward, whether by selective defoliation or by a more severe and mainly mechanical action, the judicious use of the movable pens may constitute an important aid to the improvement of farm and upland grasslands. Up to the present no experiments have been made on running houses on temporary leys, which would represent one method of dealing with "poultry sick" ground on restricted areas, and it is hoped that this will be done in the neighbourhood of Hayling Island in the next year. One instance of the running of Motley and Hosier houses on stubbles has come to the notice of the writer, and in this case the larger of the two houses showed a definite advantage over the smaller. It is probable that to make full use of stubbles either the number of birds per house should be reduced, or the houses moved more than once per day. Either of these alternatives would entail an increase in the labour cost, and it is probable that, except in a few special cases, the field house and free run still represent the most efficient means of using the available feeding on stubbles.

It should be noted, in passing, that it has been recommended in the past that birds with free access to grass should have the protein-content in the mash reduced during the flush season, when the protein content of young grass is at its maximum.

GENERAL CONCLUSIONS.

The results obtained from the Hayling Island experiment provide an interesting example of what can be done with a comparatively large unit of poultry if every stage in the process of egg production and marketing is handled with originality and boldness. Although excellent results can be obtained in practice by smaller units, it is obvious that to run a large farm on these lines, adequate capital resources must be available and considerable business acumen must be used in the purchase of foodstuffs and the selling of eggs. If, for instance, the average of eggs laid per bird was 150, the price of foodstuffs £8 10*s*. per ton, and the average price obtained per dozen eggs only 10½*d*., the hypothetical profit shown on p. 85 would be converted to a loss of £265. To obtain high egg yield from a flock composed of pullets, two-year and three-year birds, is in itself a task of some difficulty, and can only be achieved by rigorous and scientific culling, in itself only commercially possible if the birds can be profitably dealt with as table poultry. As a method of making the most efficient use of a restricted area of ground for a commercial flock, the folding-pen system must be accepted as more efficient than the slatted-floor field house and cheaper both in first cost and in labour than the intensive system. Much, however, has still to be learned of the most productive management of grassland under this system, and to make full use of its possibilities requires a secondary or alternative use of the herbage for grazing by stock, or as hay.

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II.—SOME TWEEDSIDE FARMS.

MANY accounts have been written concerning the difficulties experienced in recent years on the large arable farms hitherto worked on a "sheep and corn" basis. Attention has been drawn to changes made in post-war years in individual cases with a view to adapting the farming policy to meet the new conditions. Typical arable areas as found in East Yorkshire, the Lincolnshire Wolds, Norfolk, the Chalk Downs and the Cotswolds have been described; but that northern area, known as Tweedside—before the war predominantly arable—has not been similarly surveyed. Differing in some respects from the areas mentioned it was nevertheless in the main a "sheep and corn" district.

In the Agricultural Survey of Northumberland, by Bailey and Culley, 1794, scant reference is made to Tweedside management, and one might be led to infer that the use of the long ley in the arable rotation was of common application to the county, whereas Tweedside, with an area of lighter land, was generally farmed until recently on an ordinary four-course rotation. Sheep and corn were its chief sale products.

The District.—The area known as Tweedside includes land on both sides of the river but the farms discussed in this article are all situated in Northumberland. Tweedside has two distinct natural advantages over the districts named above, and these helped to stave off the rapid decline in arable farming which attacked the other areas with such suddenness and force. On Tweedside the shock was somewhat delayed, but it came. These advantages are firstly a more favourable soil which, for the most part, is not so easily affected by season nor so restrictive to agricultural practice as are the chalk and limestone soils ; and secondly a climate which, with its pronounced summer humidity, makes for greater adaptability to varying proportions of grass and for more regular yields of arable crops, especially roots, than is the case in other areas. These advantages undoubtedly helped the Tweedside farmer to change more gradually and surely from crops to livestock, and to make the change successfully.

The whole area has been strongly glaciated and the uneven topography, with the frequently occurring elongated knolls running approximately east-north-east, is characteristic of the country. Nowhere is the land under review above the 300 feet contour, but some of the slopes, even on land regularly ploughed, are steep. The land is intersected by a good many streams which have cut out for themselves steep-sided valleys, and along these lies a good deal of the small area of permanent grass which has never been under the plough. The valleys are naturally well watered.

The Land.—In the Tweed Valley itself is some of the most fertile land in the country—light soil, easy to work, of good depth for the most part, of very mixed origin and showing no one outstanding defect such as so frequently restricts agricultural activities on soils of light texture. Farms along the Border contain varying proportions of this alluvial soil, but on wide stretches of the valley the farms may consist almost entirely of this type of land ; probably the most famous—on the English side—of the farms containing a high proportion of Tweed alluvium is Wark, the envy of many Tweedside farmers in pre-war days, with remarkable records of production of both crops and stock under the very able management of the Culleys. As on other farms in other districts where 80 per cent. of the land was under the plough, and half of that under corn, fertility, ease of cultivation, suitable climate and all other advantages combined, were not enough to make a continuance of the " corn and sheep " system possible. On very large areas of this alluvium, the conditions might appeal to the " mechaniser," but little progress seems to have been made in that direction.

Such a favourable soil covers no more than a small proportion of the land under consideration. For the most part it consists of a light loam overlying boulder clay of varying texture. Much of the land is on the light side, very stony with occasional patches of boulders, but on the whole of good depth and easy to work. The strongly undulating nature of the land ensures adequate drainage of the higher ground, but it also causes a number of depressions needing artificial drainage. The main handicap to cultivation and especially to tractor work are the numerous steep banks.

The farms are large, usually from 500 to 1,000 acres ; the farming is rather highly capitalised, and farmers have not been afraid to invest new capital in improvements likely to show a profit, whether buildings for the comfort of livestock and more convenient working of the indoor feeding, or cottages for the greater comfort of the workpeople.

Reduction in the Area of Arable Land.—The first shock of the depression was countered on Tweedside in exactly the same way as in other districts ; the area ploughed each year declined, the area in grass increased. Farmers were compelled to make rigid and pronounced economies in corn growing. But on Tweedside the land was not left aimlessly in grass with no policy other than that of reducing expenditure upon it. If it had to go to grass, it had to serve another purpose, and that with a profitable end in view.

In spite of a lightish soil, so unretentive of moisture as to be subject to drought in very dry seasons, and a low (east of England) rainfall, Tweedside has a sufficiently humid summer climate to see grass through any but the very driest summers, such as 1921 and 1933. Practically all the land has, in the past, come under the plough at regular intervals except only certain unploughable banks and valleys which have grown most of the permanent grass. Moreover the ploughed land had by 1922 recovered a good deal of its old fertility, sacrificed to the exigencies of war-time cropping, and was in good heart.

Long leys have been advocated as the most satisfactory way of transforming a typical eighty-per-cent. arable farm to an eighty-per-cent. grass farm, but success depends on two factors, (*a*) ability to graze the new grass satisfactorily for the sake of the grass and profitably for the sake of the system, and (*b*) a realization of the fact that easily-worked arable land, especially in districts of low rainfall, does not always hold good grasses well and that, once deterioration has set in, it is almost impossible by manurial means alone to revive the turf ; to plough out and plant afresh offers the most economical solution.

The original condition of the land, the " take " of seeds and the incidence of those severe drought periods in spring and summer that sorely test the holding power of the land, are the deciding factors in the duration of the ley.

Again, long leys on light land are most successful when associated with a system of arable farming which maintains the land in good heart. They are much less successful when used mainly to allow worn-out arable land to recuperate. The proper adjustment of arable to grass and to livestock is important and should permit of a fairly high standard of fertility in the land which first produces some of the winter requirements of the livestock and is then sown down to produce good grazing.

The extent of the change from one-year leys to long leys on Tweedside farms varied considerably according to the views taken by the farmers themselves, and was determined mainly by their various cattle- and sheep-fattening policies. Individual farmers with arable land of unusually good quality, such as Tweed alluvium, continued to speculate in arable crops, introduced sugar beet and grew more potatoes. They often relied, for cattle grazing and the summer keep of ewes, on old grass on fields less suitable for the plough. They continued, thereby, to restrict their cattle and sheep output both as regards quantity and quality; in general, however, the policy of relying on more arable sale crops was less successful than were the efforts of those who developed a new livestock policy.

It is probably safe to say that on Tweedside no amount of reshuffling of arable cropping, even when coupled with labour-saving methods, was as successful in staving off the effects of the depression as was the association of increased cattle and sheep grazing with the lengthening of the life of a first-class ley.

Long Leys.—The experience with the long ley on both sides of the Border was available at first hand to the Tweedside farmer when he reduced his arable acreage. He did this simply by sowing a three-year in place of a one-year grass and clover mixture. The mixture used is some modification of the Cockle Park mixture, and on two of the farms under review the actual seedings used are as follow :—

(1)

14 lb.	Perennial Ryegrass
6 lb.	Italian Ryegrass
3 lb.	Danish Cocksfoot
3 lb.	Indigenous Cocksfoot
2 lb.	Timothy
3 lb.	Late-flowering Red Clover
2 lb.	Broad-leafed Red Clover
2 lb.	Alsike
2 lb.	Trefoil
1 lb.	Dutch White Clover
1 lb.	Kentish Wild White Clover
39 lb.	per acre

(2)

16 lb.	Perennial Ryegrass
10 lb.	New Zealand Cocksfoot
4 lb.	Timothy
1 lb.	Rough-stalked Meadow Grass
4 lb.	Late-flowering Red Clover
1 lb.	Trefoil
1½ lb.	Wild White Clover
37½ lb.	per acre

Whatever may have been the first intentions of the farmers, these leys received each year, as times got worse instead of better, a new lease of life. At the same time farmers became more and more convinced of the necessity of putting down grass to last. The best leys were doing their work exceedingly well as fattening pastures. Tweedside was still holding its own as a beef-producing area but was now doing more on summer grazings and less in yards in winter. It became a matter of paramount importance, when sowing down a ley, to produce a fattening pasture. Where malting barley and fat hoggs had occupied pride of place, a first-class long ley and fat cattle, from two-year-old and three-year-old pastures, now came into the picture. It was with greater pride that you were taken over young pastures and through groups of fattening bullocks than over corn fields.

Those of us who were supposed to be specially equipped, by technical training, to solve the knotty problems of crop failures and unsatisfactory yields, were now bombarded with questions concerning grassland and the summer feeding of bullocks.

One outcome of this new interest in long leys and their capabilities was the introduction of pasture competitions that, for three or four years, provided unique experience in the art of pasture building. During those years the Tweedside pastures were very difficult to beat by any situated in other parts of Northumberland. One such pasture, sown down in 1923 on a field called Selby's Hill, was never beaten, and is the best new pasture of which the writer has had any experience during some years of pasture judging in Northumberland and other counties. The field is 26 acres and the stock carried during each of the years 1925 and 1926 was :—

26 bullocks (finished),
26 ewes,
52 lambs (finished),
and two or three further lots of 30 lambs each.

Apart from the question of a suitable seeds mixture, the discussions on pasture-making and pasture management brought out many other matters which profoundly affect the management of these farms. Sooner or later, according to the condition of the field when sown down, its subsequent management and the quality of the land, indications of deterioration appear, the most noticeable being the encroachment of Yorkshire Fog, the loss of clover and the unevenness of grazing. Slag dressings, special attention to closer grazing, harrowing and "topping" will extend the life of the ley; but its value drops as soon as it fails to finish its quota of fat cattle in the season, and the farmer then knows that the remedy is to plough it out. During the last few years Tweedside has been reaping what benefit was obtainable from good leys laid down whilst most of the arable land was still in first-class condition. But during the last two or three years some of the less satisfactory of these leys have deteriorated appreciably, and the summer of 1933 will have hastened a few more along the downward path. There has been no great incentive, however, to increase the area of land under the plough and since, for the most part, the fields farthest from home were the first to be sown away, they can only replace, when ploughed out, those arable fields nearer home which are much more conveniently situated and cheaper to work.

On one farm this condition of affairs reached a stage where a decision had to be taken. The method of dealing with it is discussed later.

It is exceedingly difficult, on Tweedside land, to prevent Yorkshire Fog creeping into even the best of the new leys. It is the first sign of deterioration. It is now well known and steps are taken to combat it by more attention to grazing and by "topping" to prevent its seeding. Neglected leys in the district are quickly over-run by the weed, and become useless until ploughed out and re-sown ; even then the amount of seed in the land makes it risky to sow down again to grass until the field has been well cleaned and an opportunity has been given for the Yorkshire Fog seeds to germinate before destroying them by cleaning operations.

Winter Grass.—The actual livestock policies adopted on Tweedside farms vary considerably. Sheep have always been, and still are, a great standby, and the methods adopted for summer and winter feeding, whilst essentially the same from farm to farm, vary in the proportion of the flock fattened at particular times and by particular methods. Similarly, two of the farms from which most of the information in this article was obtained were chosen partly because the owner of one speculated on a bigger proportion of grass, with cattle fattening in summer only, while the other made a practice of sending out, winter and summer, a regular supply of beef and mutton.

The long leys provide summer grazing only. In September they give out, and cannot equal old grass for late autumn feeding of cattle. Moreover, the open and easily damaged turf is unsuitable for winter use, so that the outdoor wintering of stores, or of any breeding stock kept on the farm, must be done on old grass.

Store cattle for fattening are, however, not wintered out-of-doors to any extent on Tweedside farms. The ample accommodation provided in pre-war days on these arable farms for indoor feeding provides equally useful and convenient accommodation for carrying stores over the winter on farms which now specialize in summer feeding ; and it has been found that well-wintered cattle, which are gradually pushed along and carefully introduced to good grazing in spring, enable the owner to seize part of that valuable June trade in beef which collapsed so unexpectedly, and with such disastrous results to northern graziers, in 1933.

Store Cattle.—The change from arable to grazing has meant more cattle and these are almost invariably obtained from the regular sales of Irish store cattle at Edinburgh and Berwick-on-Tweed. There is a tendency to include a large proportion of heavy bullocks, which find a market at Edinburgh. The farms were already heavily sheeped so that the stocking of the fields is mixed sheep-and-cattle; and it is interesting to note how far this reduction in arable land, and its effect on the output of mutton and lamb, justify the Tyneside farmers' criticism of Tweedside methods. It is well known that arable areas, such as Tweedside was originally, can only carry their heavy quota of ewes so long as the plough continues to provide fresh land for the sheep. With a bigger proportion of grass, such as is found in South Northumberland, the proportion of cattle to sheep is higher than it is on Tweedside even since the introduction of more cattle into the latter district.

This question of fresh land for sheep is another point which is still affecting the present Tweedside policy. The slightest encouragement, such as the wheat subsidy, to plough out leys is quickly taken advantage of in all parts of Northumberland, and is partly justified by the need for new and better sheep grazings, free from parasites.

In other districts many of the recent developments which have helped former arable farmers to tide over the bad times, and which have accompanied grassing down, have been based on milk, pigs or poultry. It is interesting that none of these was ever of much importance on Tweedside in pre-war days, and very few farmers, with certain notable exceptions to be mentioned, have turned to them since. It is perhaps understandable that with no such facilities for milk marketing as occur within the hundred-mile radius of London, milk offered few possibilities, but apart from that the dairy cow has never been a popular animal in the district. The idea has persisted that sheep, and sheep alone, could profitably consume the best of Tweedside's produce. The shepherd and the horseman saw to it that their respective charges had the best of what was going. Cattle transformed straw into manure to grow crops for sheep. It was a great stride when Tweedside opened the gates of its best new pastures to fattening bullocks which could after all be herded like sheep and sold in fat-stock marts; but no one was keen on opening his gates to herds of milch cows. Neither farmer nor worker had any use for more cows than would keep the house and cottages supplied with milk and butter.

A similar attitude was adopted at first towards pigs and poultry. Northumberland had always looked askance at poultry. It was one of the few counties without a poultry instructor, but an enthusiastic and energetic agricultural organizer helped the hens to scratch their way on to one or two of the larger Tweedside farms, with results which will be described. Pigs were introduced in appreciable numbers only when the new marketing schemes made it appear probable that pig products would be a less speculative proposition in future. Pigs are only this year finding their way on to the farms on a large scale.

Barley and wheat were, and still are, grown for malting and milling purposes respectively; not for pig and poultry food. The conversion of purchased feeding stuffs into saleable produce by livestock which occupy comparatively little of the land, and require much feeding, cleaning and housing attention all the year round, did not appear to interest the majority of the Tweedside men. Now the last straw—the serious drop in the price of beef—has focused attention on other schemes which appear to offer a chance of increasing income without adding much to the more or less fixed expenditure.

LEARMOUTH FARM.

Farm Management.—This farm is just under 900 acres and the cropping has been gradually changed from the four-course rotation (80 per cent. arable) to approximately 70 per cent. grass by extending the one-year ley to a long ley; this change began about 1923. Naturally, the fields least convenient as arable were first sown with long-ley seeds mixtures and gradually a three-year mixture was adopted, instead of a one-year mixture, on all the arable land. At first these new long leys did exceedingly well and the succession of rather favourable years after 1921 enabled them, even on some of the lighter land, to hold grass of good feeding quality. Irish cattle (polled crosses) were introduced for summer fattening and the practice was extended as it was found successful.

The usual stocking for long leys on this farm is now:—

1 ewe
2 lambs
Two-thirds of a fattening bullock } per acre

The cattle are rarely moved once they settle down; the average field is about 30 acres in area and there are, therefore, about 20 cattle together.

The Cockle Park type of seeds mixture used is one of the most productive. It contains a heavy seeding of Cocksfoot which is regarded as invaluable by those farmers who have learnt how to control it during its periods of rapid growth.

The farm had, by 1930–31, almost settled down to a policy of producing beef and mutton all the year round. The main new feature of the system was the summer fattening of cattle on the extended long leys. It seemed so promising that, after a fruitless trial with baby beef for a market that turned out to be already flooded, a large new extension to the indoor feeding accommodation for cattle was erected. This new range of covered courts is 120 yards long by 50 feet wide, and is covered in one span. It is divided into seven separate courts each 15 yards square, one straw yard and one dressing pen fitted with stocks for holding cattle. A feeding passage 3 feet 6 inches wide runs the whole length of one side between the new courts and the original buildings, which include the barn with threshing mill, the turnip house with a power cutter and the cake house. They are arranged for simplicity and ease of working. Men and women can now carry out the whole of a day's work in winter under cover.

The serious drop in sheep prices in 1931–32, and in lamb prices in 1932, caused alarm, but since ewes form only a small part of the sheep sales, and since lower prices were paid for gimmers bought to replace ewes, the most unfavourable feature in the balance sheet for 1931–32 was the drop in valuation. During 1932 and 1933, however, the main products of the farm, beef and mutton, were seriously involved in the general fall in prices, and the financial year ending March 1933 was one of the worst on record—and something had to be done about it.

The general position concerning two farms in March 1933 was roughly as follows :—

Income.	£	Expenditure.	£
Sales (less livestock purchases)—		Wages . . .	2,600
Cattle . .	3,000	Rent, etc. . .	2,250
Sheep . .	3,000	Miscellaneous .	1,200
Corn . . .	1,250	Foodstuffs . .	1,500
Potatoes, etc. .	550	Manures and Seeds	500
	£7,800		£8,050

In 1933 the decline in values of beef and mutton continued and the loss of income was accentuated by an unprecedented drop in beef prices during June, so that in spite of having weathered the various phases of a long and serious depression the management was faced with what looked like a catastrophe still greater in that it affected the value of sales amounting to 70 per cent. of the total output. It was necessary to reconsider quickly both expenditure and income. As usual the labour item came under review, but rather with regard to its efficiency—value for money spent—than the amount of the weekly wage. Efficiency in the management, expenditure on raw materials (especially store cattle) and fresh sources of income were the main points considered.

Efficiency in management means more than getting the best out of the available labour: it means also the most economical use of home-grown materials, such as hay and straw and pasture grass, so that the maximum numbers of livestock can be kept with the minimum of overhead expenditure. It means also cutting down, to actual requirements, the acreage of crops, like turnips, which are relatively costly (per acre) to grow, and obtaining the necessary tonnage of such crops from a smaller area. This is well exemplified by the extended use of more intensively grown marrow-stem kale and mangolds on dairy farms in the south and of marrow-stem kale and swedes in the north.

Tweedside farmers are slow to forget the value of sheep-folding on their lighter arable land, but in these days a bigger and bigger proportion of that folding cost, including the manurial value of concentrates fed, has to be borne by livestock as less and less can be met out of corn sales. Just as this folding was formerly of advantage to arable crops so it is now of advantage to the long leys sown after sheep-folding.

Another important point affecting management was the fact that certain of the outlying fields, that had been some of the first to be laid away, and were no longer on a strict six-course rotation, were showing distinct signs of deterioration. Yorkshire Fog was getting a big hold, as was bent, and in spite of regular dressings of phosphate the fields could no longer be regarded as fattening pastures; they no longer carried their full quota of cattle and therefore were likely to deteriorate still further. Again, the sheep stocking was still heavy—it had not been reduced since the four-course rotation days—and a constant supply of fresh, clean land was necessary; even with the highest possible efficiency on the reduced acreage of arable land it was probably scarcely safe altogether to suspend ploughing, even on the most distant fields.

The result has been a complete reorganization which concentrates most of the arable work on suitable fields near home. A small area referred to as "the inner circle" contains 48 acres, entirely arable and worked on a four-course rotation, (1) potatoes, (2) wheat or barley, (3) one-year seeds, (4) oats. All the potatoes and a good deal of the seeds, hay and straw are grown on this area, which is light land, getting a big share of the farmyard manure; all the produce is carted home.

The next area, called " the middle circle ", is worked on a six-course rotation, so that no grass stays down longer than three years. It is in the main light loam, much of it under good leys which have not been down very long and which are maintained in good condition for bullock feeding and for ewe and lamb grazing. The three-year ley is mown once in three years—either in its first or its third year according to the condition of the land. Usually the hay is taken in the first year, but the tendency for oats to lodge after a three-year ley is reduced somewhat if the seeds are mown in their last year—the hay, however, is usually less clovery than in the first year.[1] There are 312 acres in " the middle circle " divided into 156 acres of ley and three 52-acre fields for roots and corn; the rotation is: (1) turnips, (2) oats or barley, (3) seeds, (4) seeds, (5) seeds, (6) oats or wheat. This area is heavily stocked with fattening cattle and ewes and lambs, and provides most of the finishing pastures for those classes of livestock.

The " outer circle " contains about 500 acres of land, most of which is in grass of varying ages. Some of the land was previously part of the general arable area, receiving dung and sheep folding on something approaching the six-course system; other fields had been sown away for some time and were showing unmistakable signs of needing rejuvenation by ploughing. Under the present system 40 to 60 acres of this area is ploughed out every year; no dung is carted to it and only the corn crop is carted home. 420 acres is kept in grass and portions are ploughed out as required. The first crop taken is turnips, which are usually folded with sheep; but one portion of the crop is fed to sheep, during the first half of the winter, on an adjoining grass field which is then mown for hay. Two grass fields are thus improved at the same time, for the treading and manure of the sheep form a fine preparation for hay, especially on leys which have been down long enough to show signs of " mat " formation.

On fields with a particularly difficult turf, folding one root crop is not always sufficient to bring the land into a satisfactory condition for corn and seeds. In such cases a second turnip crop is taken the following year and folded again with sheep.[2] After turnips the crop is oats or barley, which acts as a nurse crop to the new grass and clover mixture, and the field goes down to grass again for an indefinite period. These crops are all grown with the aid of artificial fertilizers alone, the opportunity being taken to incorporate with the soil, both for the first root crop and for the benefit of the new grass, an adequate dose of phosphate, which is the mainstay of all these Northumberland pastures.

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[1] Occasionally roots are taken after a long ley on some farms.

[2] This step is unwise on fields which show any signs of finger-and-toe in the first turnip crop.

It is not possible to treat all the old pastures in this way; apart from the fact that some are not easily ploughable it is necessary to retain some grass which will provide late autumn keep for fattening bullocks, as after September the new leys—locally known as " wild whites "—become of little use for fattening and more mature leys, with a herbage less susceptible to damage by frost, serve this purpose better.

Again, the question of providing store cattle was considered, along with the utilization of grass not up to fattening standard. Also the ewes are kept on inferior grazing from weaning until mating time. The " outer circle " produces, in addition to roots, about 20 acres of hay and 20 acres of oat straw available for winter keep, and it therefore seemed possible to introduce a number of calving heifers which could spend most of their time on the " outer circle " grass land. At present polled Aberdeen-Angus x Shorthorn heifers are used; they are served by an Angus bull and it is hoped to introduce at least 60 such cattle without reducing the numbers of other cattle. They require no extra man-power and very little other expenditure, and should provide roughly one-fifth of the store cattle needed for fattening. The " outer circle " thus provides most of the old pasture, and a good deal of the roots and long fodder, required by sheep and cattle wintered out. But it also provides a considerable proportion of high-class fattening land for bullocks and sheep, and this with the minimum of expenditure on labour.

These arrangements for cropping were made with due regard to yields of produce necessary for the livestock carried, and the opportunity was taken to prevent as far as possible the pronounced leakage which occurs on most stock farms due to over-supplies (when based on normal rations) of home-produced food stuffs. Shepherds and cattlemen rarely feel safe unless a very liberal estimate of winter food requirements has been made, so that, when acreages of hay, roots, etc., producing average yields are balanced against numbers of livestock fed, the margin of safety is usually much too high; it is absorbed partly by wastage, partly by an over-allowance to stock. A very experienced and successful north-country farmer has said that " to be really profitable, a farm should be short of grass, with too little hay and not enough labour ". Taken literally this is an exaggeration, but we know what he meant, and there is a lot in it.

The following table will show at a glance what the farm produces :—

ACREAGES OF CROPS GROWN.

	Inner Circle.	Middle Circle.	Outer Circle.	Total.
Permanent grass and old leys	—	—	310	310
New leys (1-, 2-, and 3-year)	12	156	120	288
Corn	24	104	40	168
Roots	12	52	40	104
	48	312	510	870

The cropping is, therefore :—

Grass of all ages . .	69 per cent.
Roots	12 per cent.
Corn	19 per cent.

Cattle.—Irish store cattle are bought, from January to May, at the rate of about 50 per month up to a total of about 250. Practically all of these are kept indoors until mid-April, the covered yards being filled up with stores as the fat cattle are sold. They are turned out to graze as soon as the grass is fairly well grown, the actual date depending on factors such as weather, winter keep available and the amount of grass on the pastures. Every endeavour is made to avoid being too hard on backward pastures early in the spring, as this affects their carrying capacity in that as well as in subsequent seasons, especially if the pastures have been well grazed out the previous autumn. This year (1933), for instance, the pastures are practically bare. The most forward beasts, usually the first to be bought in, are put on to the best pastures—mostly the " middle circle " three-year leys.

During the summer an average of about 70 cattle are sold fat off grass without the use of concentrated feeding stuffs. In a good grazing year more will go off grass but in a very dry season less than 70. In 1933 under 20 were sold off grass, but this was exceptional. The remainder, about 180, go into the covered yards in October and consume about two-thirds of the root crop together with hay and straw and concentrated foods. At the present time all the oats grown are consumed on the farm. Marrow-stem kale has been introduced recently as a substitute for turnips, mainly because it is necessary to grow the biggest possible weight on the reduced area. It appears to be a successful crop, and this preliminary trial has induced neighbours to put in larger acreages of it. It is new to these particular farms and has only been grown in small quantities, but the cattle relish it and do well on it, especially during the first half of the winter. Learmouth is now looking round for a suitable cutter with a view to cutting up the marrow-stem kale for the sheep.

Whilst the Tweedside farmer has a good deal to say about the influence of the present low beef prices on the gross returns from cattle, he is inclined to apportion part of the blame for the unsatisfactory margin of profit (or loss) in beef production to the very restricted sources of suitable store cattle. Canadian stores have scarcely yet found their way to Tweedside although they have been imported in considerable numbers into other parts of Northumberland. The Herefords and Hereford crosses from Canada do not appear to find such a ready market at Edinburgh as Angus crosses, and it is to Edinburgh that most of the fat cattle from this farm go.

Ireland remains the main source of supply for stores, but efforts have been made to find other supplies and, whilst the farmer was on holiday in Devon in 1932, cattle dealings in progress in Barnstaple proved too strong an attraction and a wagon of North Devons ultimately found its way to Learmouth. These did so well that another lot followed in 1933 They have found a ready sale amongst local butchers and there seems every probability that consignments will continue to arrive so long as the right type is available at the right price. As compared with the Irish, the North Devons appear to respond more quickly to good (and bad) treatment. They are said to yield a good percentage of carcase, and during the last two years they have certainly been satisfactory.

For some years Northumberland farmers have been urged to produce more stores at home, especially on land which cannot be regarded as first-class feeding land. It is the fashion in Northumberland to "feed" cattle and sheep, except on hill farms which make no pretence to have fattening grass and which are rearing farms only. One result of these efforts to finish cattle on land that is not first-class is a partial glut of cattle, not in prime condition, in the autumn fat stock marts. The drop in prices of stores has, however, not kept pace with the drop in the price of beef, and this has tempted a number of farmers to start cattle breeding.

Sheep.—In spite of all the changes sheep are still considered the backbone of the farming, about one-third of the root crop being folded off with fattening hoggs in winter. There has been no appreciable change in the way in which the sheep are managed and the size of the flock has remained constant. The ewes are half-bred (Border-Leicester x Cheviot), a cross which has no serious competitor as a grass sheep on lowland farms in Northumberland. The ewes are in "regular" ages, all four-crop ewes, in addition to any that are not sound in mouth or udder, being drafted annually. Four-crop ewes warranted sound in mouth and udder formerly found a ready sale at good prices for the rapidly increasing grassland areas further south.

Their prolificacy, good milking capabilities and general hardiness made them popular on the better types of Cotswold, Down and Midland pastures. This demand for North-Country draft ewes undoubtedly helped Northumberland farmers, who replaced them by gimmers (shearlings) bred in the north of Scotland and bought at sales held at local centres such as Reston and St. Boswells. Oxford and Suffolk rams bought at the famous Kelso ram sales are used. The aim is to produce lamb and mutton all the year round; fat lambs are sold from June to October, and hoggs off roots and grass from October to May.

Like other Tweedside farms Learmouth aims at heavy carcase weight—few Northumberland farmers believe that the extra price per pound for small carcases makes up for the extra weight in a carcase not less than 50 lb.

Two or three weeks before mating, the ewes are put on clean pastures for flushing. The average lamb crop is 166 lambs per 100 ewes put to the tup. The ewes pick up all their keep on the pastures until January; this autumn and winter grazing by sheep receiving no other foods, if it is overdone, undoubtedly affects the fattening quality of the long leys for cattle in subsequent years. Recently-sown leys are grazed with all due care, but one characteristic of the Learmouth pastures (other than old grass) is that they are a trifle thin and in view of the liberal treatment the land gets, first as arable and later as a ley, not so vigorous as one would expect. However, pastures are managed for the good of the livestock, and sheep still retain pride of place. A few roots are fed to ewes from mid-January onwards and a gradually increasing quantity of concentrated food (up to 1 lb. per head) during the month before lambing. During the last month also the root ration is increased by folding the ewes on roots for four or five hours per day. Hay is provided on a dry grass field at night. After lambing, ewes and lambs go on to the best bite of grass where, by the aid of concentrated foods, every endeavour is made to maintain a steady flow of milk and prevent any check in the progress of the lambs.

Early lambs are taken from four-crop ewes lambing towards the end of January.

Even on farms like Learmouth where about 40 per cent. of the land is arable, precautions must be taken against internal parasites, mainly worms, in lambs. Three or four monthly doses of 1 per cent. copper sulphate solution are given, the first when the lamb is six weeks old. The first dose is 1½ ounce and this is gradually increased up to a maximum of 4 ounces.

Lambs not sold fat off the ewes are weaned in mid-July. The best 50 are selected for Christmas shows and sales. Of the remainder the most forward are pushed along on the best leys (where they run with cattle) with the help of concentrates. Badly-nursed lambs also receive similar help. The others are kept on the long leys with cattle until the end of September, when they go on to roots. Aftermaths are used for the lambs not because the grazing is better than that on the ley pastures, but because it is clean, and clean ground has become more and more difficult to find as the area of arable has decreased. About 25 per cent. of the lambs have usually been sold fat by the end of August. The others receive roots, first on aftermaths, but as soon as possible on the root fields where cut turnips are fed in boxes, one man feeding about 350 sheep in this way. The Christmas show-and-sale hoggs from this farm in 1932 averaged 160 lb. live weight and would dress about 53 per cent.

The roots usually last until the beginning of April, after which any remaining hoggs are finished on grass during April and May.

Usually lambs are bought at the July and August sales and fattened after the home-bred lambs are finished in February. They replace the lambs sold fat off the ewes. Until February the number of hoggs on cut roots is kept stationary, at 350, by replacing fat hoggs sold. After February the number gradually decreases until the roots are finished.

Pigs.—This year a start has been made with pigs, but practically no new capital expenditure has been incurred. The farmer is still feeling his way. He has started with about 20 sows, utilizing the present buildings, and the main argument which determined the decision was that the buildings, especially the new covered yards, must be utilized to the full in summer as well as in winter. A small contract for bacon pigs has been made under the Marketing Scheme.

The farrowing pens are somewhat scattered amongst the older buildings; the sows run out on grass until farrowing. The young pigs after weaning are turned into the yards with the fattening cattle, there being ample straw bedding and the accommodation being warm and spacious. Cattle and pigs agree well and the pigs have many pickings from the roots, etc., fed to the cattle. The systematic feeding of the pigs, however, is done in adjoining pens—really parts of the courts—originally intended as hay stores for the cattle. Small holes, big enough for the pigs to pass through, but small enough to exclude cattle, have been broken through the walls and the pigs can pass at will from the cattle yards to their feeding troughs. Water is laid on in all these yards. The meal ration is put as a dry mash into pig troughs and water poured on. No extra labour is required as the cattlemen attend to both cattle and pigs; the arrangement has worked admirably so far.

PRESSON FARM.

The next farm to be considered in detail adjoins Learmouth. Presson is 900 acres in area and, except for about 200 acres of permanent grass, it was all on the four-course rotation until about 1922. It has gradually changed, in very much the same way as Learmouth, towards a mainly-grass farm. But the actual details of management, and some of the main lines of the policy adopted to overcome the bad times, show significant differences.

The first point of difference, and one which affects to some extent the deductions to be drawn from this account of the farming, is that whereas Learmouth has been "in the family" for some time, Presson was purchased by the present farmer-owner in 1920. He made considerable changes early in his occupation, and his treatment of land and livestock would eventually have raised the stock-carrying capacity of the farm, even under the old system. The farm is, however, typical of the district and the changes in policy were due in the main to the "times" and not merely to a preference for "higher" farming.

Farm Management.—The sowing of long leys from 1923 onwards gradually produced 720 acres of grass of all ages, leaving 180 acres for corn and roots. There was much grassing down during the first year or two but when equilibrium was reached, the cropping was (and still is) as follows :—

120 acres corn.
60 acres roots.
60 acres 1st-year ley.
60 acres 2nd-year ley.
60 acres 3rd-year ley.
340 acres leys of four years and more.
200 acres permanent grass.

Sixty acres of ley are ploughed out each year to replace a corresponding area sown down with a three-year ley.

The allocation of the land is thus :—

Grass of all ages . .	80 per cent.
Roots	6⅔ per cent.
Corn	13⅓ per cent.

Presson veered much more towards grass than Learmouth. The proportion of roots is little more than half that on Learmouth and the corn area is also slightly less. These differences are markedly reflected in the management of livestock. Winter fattening of cattle is ruled out and only half the lambs receive roots during winter. At Presson, grass has been regarded as the cheapest and most economical of foods for both cattle and sheep, and the farmer has relied almost entirely on summer feeding, and, therefore, on summer prices. No one has made greater efforts to secure high-class pastures and the results have certainly proved the efficiency of the methods adopted.

The management of grass is a striking feature of this farm. Manurial treatment is generous both before and after sowing—clean land in good heart, with a full dose of phosphates (Slag or North African Phosphate supplying about 150 lb. of phosphoric acid per acre), careful grazing at first, plenty of hard grazing with cattle and sheep later. The influence of sheep on the grass of these lighter soils has, however, been most marked for the last ten years. A large proportion of the root crop is fed to sheep on the grass and the farmer considers that this system is primarily responsible for the high quality of his leys. There is no doubt that the sheep-treading and dung have an effect on these temporary grass crops similar to that on the arable crops of the old four-course rotation.

Attention should be drawn to the various points of difference between the management of cattle and sheep at Presson and Learmouth. At Presson all the cattle are sold fat off grass, without concentrated foods, between June and October (at Learmouth most of the cattle are finished in yards in winter). Presson gets half its lambs away fat off grass without either roots or concentrates, the remainder being fattened on grass supplemented by roots carted to the grass fields, and the sale of fat hoggs being completed by January. At Learmouth hogg feeding goes on until May. Only lambs born on the farm are fattened at Presson.

Cattle.—There is at present no winter fattening of cattle at Presson. The buildings, which are ample and in good condition, are used mainly for wintering store cattle on hay alone ; three-fourths of the stores are purchased in October. They get no roots and are finished on grass. A few of the most forward, put on to the best pastures, are sold fat in June, and a steady sale of 20 per week is kept up until the whole of the 300 purchased as Irish stores have been sold—chiefly at Edinburgh. The mixed stocking with cattle, ewes and lambs is the same as for Learmouth.

Sheep.—The original flock in 1921 consisted of 400 half-bred ewes. The ewe flock now numbers 750 half-breds in regular ages. The four-crop ewes are drafted every year. The lamb crop averages the same as Learmouth (166 lambs per 100 ewes mated). About 40 per cent. of the lambs are sold fat by the end of August. No early lambs are produced, lambing commencing during the first week in March.

Turnips are fed whole to hoggs on grass from October to January, the sheep getting as many as they will consume.

It is interesting to note that when the farm was bought (1920), the intention was to produce either 1,000 lambs a year to sell as stores, or 700 to sell fat off roots. Actually, for the last few years, the production has been 1,200, all sold fat off grass and roots.

Poultry.—One of the most striking changes in Tweedside farming was the introduction of poultry on a large scale at Presson. The scheme was carefully planned to keep labour and overheads at a minimum and no effort was spared to secure the best egg market.

In 1921 two or three hundred pullets were hatched on the farm from purchased White Leghorn eggs. The laying flock was gradually increased to 8,000 hens, all reared at home, in 1931. The chickens are reared intensively until six weeks old, and at twelve weeks old they are finally removed to the laying houses where they spend the rest of their lives.

The laying houses are set out in three lots, one lot being empty from October till the following year, when the twelve-weeks-old pullets are moved into it. Each house holds 120 laying hens. The houses are made by the local joiner and are arranged on permanent grass along the water courses. They are placed 80 yards apart, and the hens have free range. The houses are constructed so that all nesting boxes, etc., are inside and cannot be damaged by cattle or horses grazing the same field.

The labour consists of four men and the farmer himself, with one extra man at chicken-rearing time. Dry mash is fed *ad libitum* in hoppers and grain is fed once a day, *the quantity being equal to the amount of dry mash consumed.* The grain is also fed in boxes inside. One man does all the feeding so that some hens get grain in the morning and some in the afternoon, but this makes no difference to numbers of eggs laid. The eggs are sold to retail shops and at first this practice resulted in a large surplus during glut periods. Concrete tanks were, therefore, built in an old Border keep—locally known as a bastille—with walls 5 feet thick and a vaulted roof. This old building had probably never been used as anything but a store place for odds and ends since the days of Border raids, when it had to hold the owner's cattle, etc., secure against theft. Each concrete tank holds about 1,700 dozen eggs in water-glass, and the total capacity is 16,000 dozen. As experience was gained, improvement in the system was effected by reducing what proved to be a too large and inconvenient surplus. The disposal of such a large proportion of the output as preserved eggs proved difficult. By advancing the time of hatching, and thus obtaining a plentiful supply of pullet eggs in autumn, the farmer has so spread production that the main sales are now of fresh eggs, through the grocer to the housewife, whilst the much smaller surplus meets the limited demand from local bakers for preserved eggs.

No poultry is fattened. Old hens are sold at Edinburgh or Newcastle. All cockerels are destroyed as soon as they are distinguishable from the pullets.

The capital outlay for egg production was about 22*s*. per hen from 1921 to 1925. It would now be about 16*s*. per hen. The output per hen was worth about 16*s*. in 1921 and about 10*s*. in 1933. The gradual drop in egg values was fortunately accompanied by a drop in feeding stuff values, but it is fairly certain that during 1933 the hens have contributed nothing towards the rent. The original capital cannot, however, easily be realized and depreciation on houses, plant, etc., is considerable, so the hens remain for the present. They undoubtedly helped during the lean years 1922 to 1930.

Pigs.—By 1932 it was necessary once again to take stock of the position. Beef and mutton prices got worse instead of better. Complete reliance on summer production and summer prices was probably less satisfactory than an all-the-year-round production, and judging by still more recent developments at Presson, the need for reorganizing the livestock policy was at least as pressing on this more grassy farm as on Learmouth with its more expensive cattle and sheep feeding. Pigs seemed to be the only available new line in livestock and, after taking every step to ensure the best start, a visit to the West of Scotland College piggeries at Auchincruive resulted in the erection at Presson in 1933 of accommodation for the production of 400 bacon pigs a year.

A start was made with 12 pure-bred Large White gilts and the number has now been raised to 35 (a one-man unit). The sows farrow in the old buildings after remaining out on grass up to farrowing time. All feeding stuffs are bought except the roots laid out on grass for sows. A contract for bacon pigs has been made under the Marketing Scheme.

The piggery is a copy of that at Auchincruive except that the dung passage at Presson is twice as wide. A roof of asbestos sheets was built over existing outer walls. The whole floor is concrete, enclosing a thin waterproof course of bitumen to prevent damp rising, and the walls subdividing the building are of brick and about 4 feet high. There is a central feeding passage 3 feet 6 inches wide with pens on either side each 9 feet × 8 feet to hold 10 weaners which are reduced, on the average, to 8 baconers (after culling, say, 2 for pork). The dung passages are on the outside and are each 6 feet 2 inches wide. As water is laid on, the dung passages can be hosed and water from conveniently placed tanks can be poured on to the dry mash fed in glazed-pipe troughs. The outside walls are 9 feet high at the eaves and the roof is 18 feet high at the ventilated ridge. There are 20 pens to hold a total of

200 pigs ; each pen has a liberal allowance of straw. The whole building is 93 feet × 33 feet and is well lit by roof lights. The total cost, exclusive of outside walls, was £500. The piggery is kept locked ; no admittance except on business ! Fattening pigs are to be kept quiet and undisturbed at Presson.

For hens and pigs all meals are ground at home and the latest grinding machinery has been installed for that purpose.

But the position is not yet stable. As on other Tweedside farms, leys deteriorate and 1930 to 1932 marked the time at which some of the earlier sown leys were past their best. 1932 was a critical year for the business of producing beef and mutton. The restricted period over which beef was sold, and the consequently restricted range of prices obtained for fat cattle from Presson, gave returns which apparently compared not too favourably with those from Learmouth.

The new pig policy has increased requirements for straw, etc. All these points, strongly supported by the wheat subsidy, have influenced the farmer in deciding this year to increase the arable acreage. It is impossible to keep up the high standard of the fattening pastures unless the plough can be speeded up to reach each pasture after about 7 or 8 years. The arable area is, therefore, to be increased next year by ploughing out 100 acres of ley instead of 60 acres. The present plan is to grow 100 acres of wheat. This will enable the cattle policy to be modified so that about 60 per cent. of the cattle may be sold fat off grass and 40 per cent. fattened in yards in winter. This winter, any cattle not prime by October are being finished in yards. Slightly younger bullocks can be bought and fattened if the time is thus lengthened, and a larger proportion of stores can be bought in spring. The advantage would appear to be that cattle wintered in Ireland up to the end of January and then bought in to Presson do better than cattle which spend a longer time indoors on dry feed such as hay without roots.

The reader will have gathered that what goes on at Presson is well known at Learmouth and *vice versa.* He may also have assumed that important steps vital to the future of these farms have not been undertaken without lengthy discussion and much friendly argument between neighbours. The assumption is correct, but after agreeing to differ on many important points each farmer proceeds to put his own convictions to the test. There is no better tonic for anyone interested in agriculture than to join in one of these Tweedside farmers' discussions.

If the farmer's whole time, energy and skill are given to the management of the farm and the marketing of produce, that of the workers is also fully at the disposal of the farm ; in no agricultural district is greater pride taken by the workers themselves in the general work of the farm, the cultivation of land, the production of good crops and the care of livestock. In no district is the relationship between master and man better. Sympathy on the part of these workpeople, who have spent all their lives on the farm, for the position of Tweedside farming as a whole and that of their master's farm in particular, is no small asset to the farmer in times of serious depression. There is no doubt that on Tweedside this feeling is engendered to a very large extent by the confidence of the workpeople in the experience and ability of the farmers themselves. They have exceptional ability in the selection and handling of livestock for fattening purposes, and probably only the shepherds would question the statement that nobody could do it better.

Well educated and initially well endowed with capital, training, skill and experience, no farmers could have put up a better fight than these Tweedside men against the tremendous odds of the later post-war conditions. They fought the decline first of corn prices, then of sheep prices; now they are having to fight the decline of beef prices. To be constantly in touch with these men is to retain confidence in their ability to pull through.

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REPORT OF THE RESEARCH COMMITTEE, 1933.

The Society, through its Research Committee, has continued to assist agricultural research by means of financial grants towards the cost of several investigations. The following Report deals with the more important developments of the past year.

I.—WORK COMPLETED.

Two investigations have been completed and the full reports of the investigators are appended. In the first of these on "Green Manuring and Sheep Folding on Light Land" Dr. E. M. Crowther summarises the experimental results obtained at Woburn on this subject and puts forward a new explanation of results which have hitherto not been understood.

The second, by Mr. F. Rayns, deals with the results of sheep feeding experiments carried out, in three successive years, in order to arrive at the comparative values, for fattening sheep, of swedes and sugar-beet tops.

II.—WORK IN PROGRESS.

ROTHAMSTED EXPERIMENTAL STATION.

WORK ON THE INOCULATION OF LEGUMES, 1933.

(*a*) *Infection of the Root-hairs of Lucerne by the Nodule Bacteria.*—It has been found in previous work that infection of the root-hairs by the nodule bacteria is necessarily preceded by a characteristic deformation of the hairs. This deformation is produced by a secretion of the bacteria which can be separated from them by filtration. The action of this substance upon the hairs is impeded by the presence of nitrate.

The nature of this active substance has been further investigated. It has been found to be thermostable, that is, it will remain active after being heated to 120°C. for 15 minutes in an autoclave. This suggests that it is a relatively simple chemical compound and not a protein. From the filtrate of a suspension of nodule bacteria a gummy substance can be precipitated with acetone, and this substance, when dissolved in water, has been found to be active in deforming the root-hairs of lucerne. Further purification of this gum is now being attempted.

The bacterial secretions and the gummy substance not only produce a deformation of the root-hairs but greatly increase both the number of root-hairs formed and their length. The active agent thus appears to be a growth-promoting substance. Different strains of nodule bacteria are known to vary greatly in their virulence and also in the amount of gum that they produce. The present work suggests that these two qualities may be connected.

(*b*) *The Effect of Nitrate on the Development of Lucerne Nodules.*—The well-known effect of nitrates in checking nitrogen-fixation in legumes has been shown to be the result of two processes. (1) Nitrates check the curling of the root-hairs and thus reduce the infection by the bacteria, and (2) they harmfully affect the development of such nodules as are formed. It has been found this year that nodules growing in the presence of nitrate tend to become encased in cells having thickened walls, which check the growth of the nodule and the multiplication of the bacteria within. This is apparently a defence mechanism on the part of the plant against an unwanted infection.

(*c*) *Clover Inoculation in Wales.*—Clover inoculation with cultures prepared at Rothamsted is being tested, by Prof. Stapledon, on Welsh pasture soils in the neighbourhood of Aberystwyth. The results so far are promising, but it is too early to judge the value of the process. The strains of bacteria that are being tested include both foreign strains and some isolated from Welsh clover plants.

(*d*) *Sale of Lucerne Cultures.*—Allen and Hanburys have sold 5,920 cultures for the inoculation of lucerne during the present year. This represents the sowing of about 4,000 acres of inoculated lucerne, and compares with 3,100 cultures in the previous year.

THE USE OF ELECTRIC POWER—ROTHAMSTED FARM.

Since the installation of electricity on the Farm in June 1932 it has been used wherever possible for both light and power, and tests have been carried out in order to obtain information regarding its uses, its limitations and its comparison with the older forms of power. By inserting watt-hour meter boards in the various circuits, measurements of the power consumption for most operations have been obtained, and whenever possible the time taken has been recorded.

Lighting.—The buildings and Dutch barns have been wired for light, and numerous plug outlets have been provided at points where lights are only occasionally required. For these plugs there are two large portable lamps which have been very useful at lambing time and when threshing has been carried out in the barns during winter. The multiway switching used has obvious advantages over single-way switching.

Power.—A series of comparisons was made, on a large combined grist and rolling mill, between the 20 h.p. motor and a 10–20 International Tractor. Identical weighed quantities of the foodstuffs were dealt with, first by the one and then by the other, and full particulars were recorded of the time taken to start, of the fuel and oil or electricity consumed and of the time taken to complete the operation.

The speed of the mill and its setting were kept as nearly uniform as possible, and samples of the finished product were taken. The results will be published as soon as sufficient body of data has been accumulated.

A 10-h.p. direct-coupled mill and motor has been installed, replacing one of the same type which was driven by the tractor through a countershaft. The mill is mounted on a large concrete block so that the hopper can be fed directly from the granary above and the product bagged immediately if desired. A considerable number of figures has been obtained, especially for barley grinding and oat rolling. With the former operation it is noticeable that the consumption of electricity has been gradually rising, presumably owing to the wearing of the plates. In kibbling beans, and in rolling, this tendency has not been noticeable, as there is very little wear on the rollers. Readings are being continued as occasions offer.

A 5-h.p. Drumotor has been substituted for a 5-h.p. internal combustion engine and has proved very satisfactory for such operations as root pulping and slicing, and for driving the hay elevator. Ease of starting, and ease and quietness in operation, are definite advantages. It is easy to transport and very robust. No detailed tests have as yet been carried out but it is hoped to obtain figures, during the present winter, for root pulping and straw elevating.

A separate 2-h.p. motor is being used to operate a fixed hoist and a cake-breaker. The advantage of the separate installation is considerable since previously these machines had to be driven off the countershaft, necessitating the use of the tractor. Readings for cake-breaking are being accumulated.

The smallest motor is a ½-h.p. portable unit used for such operations as potato-sorting, corn-dressing and winnowing, and mower-knife sharpening. This motor replaces a man at a very much lower cost, and provides a more regular and steady supply of power. Readings will be secured for the dressing of this season's corn and potato crops.

There has been no serious breakdown of any of the equipment.

MASTITIS IN COWS.

Research work on Mastitis has been continued at the Research Institute, Royal Veterinary College, London, during the year 1932–33.

1. *The Bacteriology of Mastitis.*—(*a*) An account of the investigations under this heading was given in last year's Report of Research Committee (Ref. 1). Work carried out since that report was submitted has served to confirm the position there outlined. Of the three groups of streptococci, which are responsible for streptococcus mastitis in cows, chief importance is to be attached to that designated Group I, since this causes the contagious form of the disease, which is so prevalent in cows in milk.

(*b*) There is also known to occur in cows a form of mastitis which is caused by staphylococci bacteria which are different in certain respects from streptococci. Staphylococci produce a form of mastitis in which there is a tendency for parts of the udder to become gangrenous, and although this does not appear to be very common in cattle it is serious inasmuch as it frequently causes the death of the affected animal. During the past year much time has been spent in studying the nature and activities of udder staphylococci and conclusions are being formed as to the way in which gangrenous mastitis should be controlled. This work is still proceeding and the results will be dealt with in the next report of the Committee.

2. *Contamination of Market Milk with Mastitis Bacteria.*—An investigation to obtain information on the extent to which the mixed milk of the country contains mastitis streptococci is now in progress. So far the indications are that milk supplies are extensively contaminated and it is hoped to publish a detailed paper on the subject during 1934. In the meantime, however, it should be made clear that such contamination by no means implies a danger to the health of human beings who consume such milk in the raw state. The findings, however, do show that much of the milk retailed to the public comes from diseased udders and, for this reason, is of inferior quality.

3. *Diagnosis.*—In last year's Report it was pointed out that a large proportion of cases of streptococcus mastitis are not obvious on clinical examination of the udder or on simple inspection of the milk. Hence there arises the necessity for employing some laboratory method of examination which is capable of detecting such hidden cases. For this purpose, a special bacteriological culture medium has been devised, and during the past year this has been perfected and thoroughly tested on many hundreds of milk samples. It is claimed that this medium will constitute a very valuable aid in diagnosing cases and, consequently, in assisting control of the disease.

4. *Control of Mastitis.*—This has continued to be a main object of our investigations, special attention being paid to the common contagious form of streptococcus mastitis. The lines being followed in this work, as mentioned in last year's Report, consist of picking out infected cows by suitable diagnostic methods and having them milked last.

Reference was also made in last year's Report to a self-contained herd in which the investigations gave good promise that control measures would be successful. This work has now been concluded and a full account has recently been published (Ref. 2). The herd originally consisted of 53 cows and heifers, of which in June, 1928, 10 were found to be affected with chronic streptococcus mastitis. Preventive measures, in accordance with which, during the first two years, the infected cows were milked last, and were subsequently kept on separate premises, have led to the formation of a group of cows which for no less than three-and-a-half years have remained free from the streptococci of contagious mastitis. This does not mean that the herd has been entirely free from udder trouble, because contagious mastitis is not the only form of udder disease in cows; but it does mean that this herd has been kept free from the most prevalent form of the disease. It is also of interest to note that five of the originally infected cows ultimately made a complete recovery. Unfortunately, little comfort is to be derived from this fact, because it is known that quite frequently cows which recover do so only after several years, and even then, as a result of the disease, their milk-secreting tissues are extensively and permanently damaged. The observations on this herd are, however, of great importance because this is the first time it has been conclusively shown, by frequent and searching tests of the milk, that a herd of cows can be maintained free from this particular kind of infection. It has, therefore, been possible to produce the final proof that chronic streptococcus mastitis is a contagious disease and, therefore, theoretically preventible by what are in reality simple measures.

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2. Studies on Bovine Mastitis. VIII.—" The Control of Chronic Streptococcus Mastitis ", F. C. Minett, A. W. Stableforth and S. J. Edwards. *Journal of Comparative Pathology and Therapeutics.* Vol. 46, p. 131 (1933).

THE ECONOMIC DISPOSAL OF SUGAR-BEET BY-PRODUCTS.

This investigation, continued at the Norfolk Agricultural Station during the past year, is divided into three sections :—

1. The feeding value of sugar-beet tops for fattening hoggets.
2. The manurial value of sugar-beet tops when fed to sheep and when ploughed in.
3. The feeding of wet sugar-beet pulp for fattening bullocks.

A full account of the results of the sheep-feeding trial is given elsewhere in this Journal (see p. 151), while reports on the feeding value, for fattening bullocks, of dried sugar-beet pulp and of sugar-beet tops have been given in earlier issues.

2. *The Manurial Value of Sugar-Beet Tops when Fed to Sheep and when Ploughed in.*—Briefly, the manurial value is being measured by obtaining the yield of the following barley crop and of the succeeding crops in the rotation. This trial has now been running for three years and some degree of finality has been reached as regards the yields of the barley crop.

The results show that the effect of folding sheep on sugar-beet tops or swedes is to increase the yield of barley by about 7–9 bushels per acre, the higher increase being obtained where the sheep have been fed on beet tops. A similar increase in yield has been obtained by ploughing the tops in or by carting the tops off and applying a complete mixture of artificials costing about £1 per acre. The time of sheeping appears to affect the yield of barley, the yield being smaller the later the sheep are kept on the land.

Similar results have been obtained with the hay crop after the barley. The effect of the sheeping, or of ploughing in the beet tops, or of carting off the tops and applying artificials for the barley, is to increase the yield of the hay crop by some 5 cwt. per acre. Only one year's results are available for the wheat crop, but there is an indication that the sheeping will increase the yield of the third crop in the rotation, though not to such an extent as with the first (barley) crop.

3. *The Feeding Value of Wet Sugar-Beet Pulp for Fattening Bullocks.*—A measure of the feeding value was obtained by comparing the live-weight increases of nine bullocks fed on wet pulp with the increases of nine similar bullocks fed on mangolds. Both lots of bullocks received the same amounts of hay and concentrates, but while one lot was fed 75 lb. of fresh beet-pulp, the other lot was fed 112 lb. of mangolds per head per day. The trial lasted for 22 weeks and the bullocks were weighed monthly.

Over the whole period the bullocks fed on wet pulp gained 1·9 lb. each per day, while those fed on mangolds gained 2·1 lb. per day.

The feeding value of clamped wet pulp was also studied, the pulp having been clamped for three months prior to feeding. The bullocks consumed 60 lb. each per day, their live weight gain per day being 1·9 lb. The bullocks receiving 90lb. of mangolds per day gained 2·2 lb. per day.

Wet pulp feeding had no effect on the percentage of dead to live weight, or on the quality of the meat.

EXPERIMENTS IN HAMPSHIRE.

The series of experiments designed to compare sheep-folding with alternative methods of maintaining the fertility of light soils has been completed. Applications of artificials alone, and of artificials and straw, were compared with folding (with and without straw) and with no manurial treatment. The results obtained at different centres are, however, so conflicting that it seems impossible, for the present, to draw any general conclusions.

The experiments with lucerne have also been concluded except that the plots are being kept under observation. It is evident, however, that accidental circumstances, such as drought and the prevalence of weeds, have exerted far more important influences upon the crops than the differential treatments that the experiments were designed to compare. If it appears that any general conclusions can be drawn they will be embodied in next year's Report.

GREEN MANURING AND SHEEP FOLDING ON LIGHT LAND.

AN ACCOUNT OF THE GREEN MANURING EXPERIMENTS AT THE WOBURN EXPERIMENTAL STATION 1893–1933.

SINCE about the middle of the last century agricultural chemists and field experimenters have paid little attention to the effects of the individual crops of the rotation on the immediately following crops or of the long continued use of different rotations on the maintenance or improvement of soil fertility. The crop rotations were stabilized by long tradition and custom, and during the nineteenth century experimental work was concentrated on the behaviour of the new artificial fertilizers. Even those who doubted the ability of these fertilizers to maintain soil fertility for long periods failed to establish any experiments which could bring out the essential merits of dung over inorganic fertilizers. In recent years the amount of dung available in the more purely arable districts is decreasing rapidly through the increasing use of mechanical power, not merely for haulage but for cultivation and harvesting, whilst changing economic conditions require the introduction of new rotations. Many farmers are now asking whether these new methods of cropping will maintain the fertility of the soil. Unfortunately the lack of systematic observations and experiments, on different rotations over long periods, makes it difficult, if not impossible, to say how far the maintenance of soil organic matter is really essential or how far effects similar to those of dung may be attained in other ways.

Green manuring and the folding off of green crops with sheep have long been used successfully on light land, both in definite rotations and by taking catch crops when soil and weather conditions happened to be favourable or when sheep food was particularly required. Under these conditions, and especially when the prime purpose is to provide an uninterrupted supply of food for stock rather than to manure the soil, it is impossible to analyse the effects of the individual crops and methods and it is therefore difficult to answer the modern enquiry as to how far green manures are an effective substitute for dung. Some rather inconclusive experiments were conducted for the Royal Agricultural Society between 1924 and 1927 by Mr. H. J. Page (Ref. 1). The only prolonged experiments on green manuring in this country are those at the Woburn Experimental Station. These were planned as a practical demonstration of an established principle—the fixation of atmospheric nitrogen by leguminous plants—but they gave results which have long seemed paradoxical and which, until recently, were entirely unexplained. Even now no complete explanation is forthcoming, but a consideration of the older results in the light of recent work may serve to direct attention to other similar discrepancies between expectation and experience, and to show the necessity of further observations and experiments on different methods of adding organic matter to the soil. Although the Woburn results can give no clear guidance for current practice, they bring out important points for consideration in any future experiments on green manuring and at the same time they illustrate the difficulty of attempting to solve practical problems by the older type of apparently simple and direct field trials.

The purpose of the Woburn experiments on green manuring was defined by Dr. J. A. Voelcker (Ref. 2) in 1897 in the following words: "Following up the recently ascertained truths respecting the assimilation of the free nitrogen of the air by the leguminous plants, it was sought to ascertain whether, by growing green crops of a leguminous nature and ploughing them in as a preparation for a corn crop, a better corn crop will result through the enrichment of soil by accumulated nitrogen than where a non-leguminous crop was grown". The results were surprising. After tares (vetches—*Vicia sativa*) the wheat crop was almost invariably poorer than after mustard (*Sinapis alba*) and, further, the yields on both sets of plots steadily declined. Summarizing the results thirty years later, Dr. Voelcker said in a contribution to a Rothamsted Conference on Green Manures (Ref. 1): "Altogether it seems quite unaccountable that such miserable crops of wheat should follow the pursuit of what may ordinarily be considered good farming practice. It is quite evident that there must be some factor as yet unknown to us, which produces a result not only at variance with scientific deductions, but with practical experience generally, for without assuming some disturbing element of this nature, it is incomprehensible that liberal treatment such as these plots have received could result in the production of crops so meagre. Many have been the attempts I have made to find a possible explanation and many the suggestions put forward but none has so far been found to be tenable."

A general summary of the conclusions from the green manuring experiments was included in Dr. Voelcker's review (Ref. 3) in 1924 of the work of the Woburn Experimental Farm. The yields for the individual plots were given annually in this Journal (Ref. 4) from 1897 to 1921 and subsequently in the Reports of the Rothamsted Experimental Station, but they have not hitherto been brought together and discussed. At intervals over the thirty years pot experiments and laboratory work on soils from the green manure plots and on the green manure materials were conducted at Woburn and in the last few years at Rothamsted, but only those of the years 1929 and 1930 by Drs. Crowther and Mirchandani (Ref. 5) have been published. Some of the results of the early work and also of recent unpublished work by the author and Mr. T. W. Barnes are given in the present paper.

THE FIELD EXPERIMENTS.

Since the experiments were laid down before the necessity for adequate replication and statistical control was realized, and since the actual plots and the sequences of cropping were changed in the course of the experiments, it is necessary to give the layout and history of the plots in some detail in order that due caution may be exercised in interpreting the yields for isolated years.

Fig. 1 gives the original and the final arrangements of the plots in the two experiments in Lansome Field and Stackyard Field. In both experiments the cropping rotation was essentially summer green crops followed by winter wheat.

LANSOME FIELD EXPERIMENT.

This experiment commenced in 1892 as three long strips, each of one-third acre, of tares, rape and mustard respectively. The plots were subdivided so that those shown in the upper half of the diagram received mineral manures, at the rate of 3 cwt. of superphosphate and 2 cwt. of kainit per acre, in each year with green crops. The plots shown in the lower half had no mineral manures, but in 1904 received lime at the rate of 1 ton per acre. The general rotation of crops was two successive summer green crops ploughed in during the same summer, the second followed immediately by autumn-sown wheat. There were, however, a few breaks in this rotation ; spring-sown barley was grown instead of winter wheat in 1893, 1895 and 1904, and winter oats instead of wheat in 1913. The barley of 1904 and the oats of 1913 followed immediately after a wheat crop without an intervening year devoted to green crops. By about 1918 the plots had become " very foul and the weeds—horsetail in particular—choked the green crops in many places and quite prevented any uniform growth ". In 1917 the wheat on half of the plots was so poor that it was discarded and the rotation was interrupted for cleaning operations. The plots were fallowed in 1919, but in spite of this the barley crop sown in 1920 failed. It was then decided to redesign the experiment by abandoning the use of rape and dividing the rape area between the adjoining mustard and tare plots. Three new plots on adjacent land were brought in. The experiment now consisted of " old mustard " and " old tares " plots, " new mustard " and " new

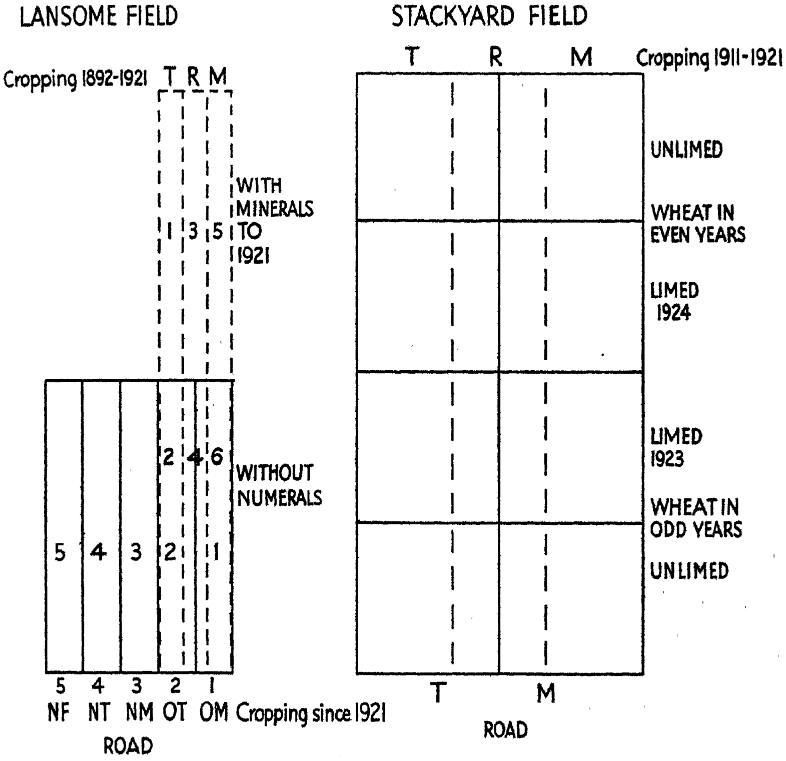

FIG. 1.—Plan of Woburn green manure experiments. M =Mustard, T = Tares, R = Rape, F = Fallow.
Lansome Field. Dotted lines, 1892 to 1921. Upper half with minerals to each green crop, lower half with lime in 1904.
Full lines, since 1921. O = old plots, N = new plots.
Stackyard Field. Dotted lines; 1911 to 1921.
Full lines, since 1921.

tares" plots with one plot which was fallowed whenever the other four had green crops. Each plot is ¼ acre in area. All five plots received 5 cwt. of basic slag and 1 cwt. of sulphate of potash per acre in 1921. Green crops were grown in 1921 and winter wheat in 1921–2 and this rotation has continued since. One-half of each plot received 2 tons of lime per acre in 1923.

Throughout the experiment the tares were generally sown in April and the mustard and rape in May. These green crops were ploughed in about the first or second week of July and the second green crops sown at once. These in turn were ploughed in at the end of September or early in October and the land prepared immediately for sowing wheat. In three seasons

(1905, 1907, and 1909) attempts were made to secure better crops of tares by sowing winter tares at the end of the previous October. In the third of these years the winter tares failed and spring tares were sown instead for 1909 and in each of the subsequent years. The mustard and rape were sown in late spring throughout. It will be noted that in this sequence of cropping the land received many cultivations during the preparation of the land for two summer green crops and one wheat crop in a single season. It was sometimes observed that there was difficulty in getting the land sufficiently consolidated to make conditions favourable for the proper growth of wheat. Partly for this reason, and partly because of the common belief in the value of the "golden hoof" of the sheep on such light land, a new experiment was started in 1911 in Stackyard Field on the site of the old Rotation A (four-course rotation) immediately adjoining the continuous experiments on wheat and barley.

STACKYARD FIELD.

The site was an area of 4 acres known from past experience to be more uniform than that of the original Lansome experiment. The experiment began in 1911 with three parallel strips of tares, rape and mustard respectively, and all plots received 4 cwt. superphosphate and 1 cwt. of sulphate of potash per acre. The plots shown in the lower half of Fig. 1 had 1 ton of ground lime per acre and those in the upper half 2 tons of lump lime per acre. Originally it was intended to have two green crops in each season, but in most years this proved impossible. The green crop or crops were fed off on the land by sheep which received some cake, generally a mixture of cotton-seed and linseed cakes at the rate of about 1½ cwt. per acre per annum until 1922 and subsequently about twice this amount. From 1911 to 1932 inclusive about 24 cwt. of cake per acre was used in feeding off the crops of 13 seasons. This amount contained about 0·10 cwt. of nitrogen (equivalent to half a hundredweight of sulphate of ammonia) per acre, added to the land every second year.

The tares were sown in March or April and the rape and mustard in May. The crops were ready for folding off, according to the season, some time during June, July or August. The folding extended over two, three or four weeks according to the size of crop and the number of sheep available. It naturally followed that the soil was often too dry, or the remaining time too short, for a second green crop in the same season. Only in 1922, 1923 (mustard only), 1930, 1931 and 1932 was it found possible to grow a second green crop. It was recorded that the green crops of 1911 and 1931 were small.

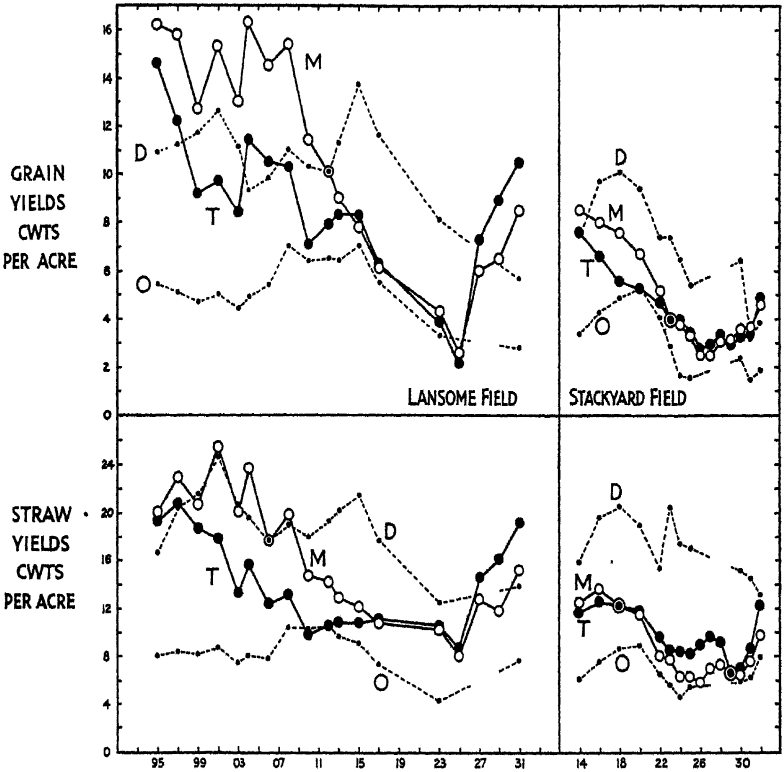

FIG. 2.—Yields of Wheat grain and straw in Lansome Field and Stackyard Field green manure experiments and of continuous wheat in the same years. Means of three wheat crops plotted for the middle year.
Full lines, open circles (M) wheat after mustard.
Full lines, closed circles (T) wheat after tares.
Dotted lines, (D) wheat with dung annually 1876 to 1926.
Dotted lines, (O) wheat unmanured since 1876.

The experiment was redesigned in 1921. The use of rape was abandoned and the area divided between the adjoining mustard and tares plots. Further, in 1922, wheat was grown only on halves of the plots and the green crops repeated on the other halves so as to provide for this and subsequent years both wheat crops and green manure crops every year. The plots were further subdivided into limed and unlimed halves, lime being applied at the rate of 2 tons per acre on one set in 1923 and on the other in 1924.

It will be noted that the Stackyard Field experiment not only had the cultivations necessary for ploughing up a wheat stubble, preparing a seed bed for green crops, ploughing this up and again preparing a seed bed for wheat, but had in addition, in most years, a period of two or three months' fallow between the sheep folding and the preparation of the wheat seed bed. The conditions of neither rotation experiment resemble in any way those for green manuring by catch crops taken at odd intervals between other more directly valuable crops. It may be noted too that though the Stackyard experiment was really on "sheep folding" it has been the custom at Woburn to speak of it as a "green manuring" experiment because it ran parallel with the Lansome Field green manuring experiment.

THE WHEAT CROPS.

The yields of the wheat (or other cereal) crops for all of the years are given in Table I for Lansome Field and in Table II for Stackyard Field. The years refer to harvest years in all cases and the yields throughout the paper are given in hundredweights per acre. In order to bring out more clearly the general trend of yields the results are also given graphically in Fig. 2 in the form of averages of three consecutive cereal crops plotted for the date of the middle crop. For comparison with the wheat yields after green manures those of continuous wheat in the same years are also given for two manurial treatments, *viz.* unmanured and farmyard manure, the latter at the rate of about 7 tons per acre and containing on the average 0·94 cwt. of nitrogen per acre per annum. The continuous wheat ran uninterruptedly from 1877 to 1926 inclusive; it was then interrupted for two years of fallow and from 1929 to 1933 inclusive was grown without any manure. For simplicity the yields of wheat after green manures are given only for wheat after tares and after mustard, wheat after rape gave results consistently between the other two.

The first few years in the Lansome experiment gave good crops of about 30 to 40 bushels of grain and a ton of straw per acre. The land was clearly of normal fertility and the yields of grain were well ahead of those on the Stackyard plots which had been cropped for twenty years continuously with wheat receiving dung. The grain yield of wheat after mustard was maintained at a satisfactory level until about 1910 *i.e.* for about 10 crops; subsequently it fell off rapidly and steadily, literally to vanishing point by 1927. The wheat after tares behaved quite differently, for the grain yield fell off rapidly in the first few years and then remained for about ten years at about two-thirds of that given by wheat after mustard. The wheat crops after both green manures in the war years and in the broken sequence of crops in the early 'twenties were little better than those of wheat grown continuously without manure since 1876. The necessity for breaking the continuity of the Lansome experiment in 1919 and of the permanent wheat and barley experiments in 1926, to provide fallow is sufficient evidence that at this period the low yields in all of the experiments were believed to be due in part to the increasing weediness of the land.

The straw yields after mustard were similar to those of the permanent wheat with dung until about 1908, but in this period the straw yields after tares had fallen steadily from a level of the dunged plots to those of wheat grown continuously without manure since 1876.

TABLE I.

LANSOME FIELD.

Alternate years of green manures ploughed in and wheat
(with a few breaks as shown).

YIELDS OF CEREAL.

Green Manures.	Cereal.	Grain, cwt. per acre. After tares.	After rape.	After mustard.	Straw, cwt. per acre. After tares.	After rape.	After mustard.
1892	1893 Barley	20·2	19·7	17·9	19·8	20·6	19·7
1894	1895 Barley	14·6	17·7	20·0	16·8	16·3	22·3
1896	1897 Wheat	9·0	10·5	10·7	21·4	22·1	18·1
1898	1899 Wheat	13·2	13·6	16·9	23·9	23·1	28·2
1900	1901 Wheat	5·6	8·7	10·6	10·7	13·5	15·4
1902	1903 Wheat	10·3	12·1	18·4	18·8	20·7	32·5
—	1904 Barley	9 3	8·4	9·9	10·5	9·3	11·9
1905	1906 Wheat	14·5	19·7	20·6	17·7	26·2	26·4
1907	1908 Wheat	7·7	10·6	13·0	9·0	12·8	14·6
1909	1910 Wheat	8·6	12·3	12·7	12·7	17·3	18·5
1911	1912 Wheat	5·1	6·6	8·6	8·0	9·0	11·1
—	1913 Oats	10·1	9·0	9·1	11·3	11·4	13·0
1914	1915 Wheat	9·7	11·1	9·4	13·4	16·2	14·7
1916	1917 Wheat	5·2	5·3	5·1	7·8	6·5	8·8
Mean cereal yield 1893–1915.							
With minerals		10·5	12·4	14·2	14·9	17·3	19·8
Without minerals		10·7	12·2	13·1	14·9	16·3	18·1

1918	Green crops.
1919	Fallow.
1920	Barley, crop failed.
1921	Green crop.

		Grain, cwt. per acre.					Straw, cwt. per acre.				
		Old Plots.		New Plots.			Old Plots.		New Plots.		
Green Manures.	Cereal.	After tares.	After mustard.	After tares.	After mustard.	After fallow.	After tares.	After mustard.	After tares.	After mustard.	After fallow.
1922	1923 Wheat	4·0	4·0	4·1	4·1	3·2	12·4	8·9	13·9	9·3	8·6
1924	1925 Wheat	2·5	3·9	2·6	2·6	2·3	11·4	13·1	11·8	13·3	13·7
1926	1927 Wheat	—	—	0·2	0·1	0·2	—	—	2·6	2·4	4·4
1928	1929 Wheat	19·3	14·2	16·2	12·0	9·6	29·8	22·9	29·6	20·0	23·9
1930	1931 Wheat	7·1	5·2	6·1	6·7	4·8	16·2	10·1	22·2	14·6	10·9
1932	1933 Wheat	5·0	5·1	5·2	5·5	4·8	12·2	12·7	11·5	11·7	9·4

TABLE II.

STACKYARD FIELD.

Alternate years, green manure folded off, and wheat.

Wheat harvest year.	Wheat grain, cwt. per acre. After tares.	After rape.	After mustard.	Wheat straw, cwt. per acre. After tares.	After rape.	After mustard.
1912	9·4	10·7	9·3	13·0	14·6	12·6
1914	8·9	11·0	9·7	12·9	15·4	14·3
1916	4·6	5·8	6·5	9·1	9·8	10·6
1918	6·4	7·9	7·9	15·7	15·7	15·8
1920	5·9	7·8	8·3	12·0	10·9	10·6
1922	3·7	—	4·0	7·8	—	8·5
1923	4·5	—	3·2	9·3	—	5·3
1924	3·8	—	4·8	8·7	—	9·5

	After tares. Unlimed.	Limed.	After mustard. Unlimed.	Limed.	After tares. Unlimed.	Limed.	After mustard. Unlimed.	Limed.
1925	4·1	3·1	3·7	2·8	8·3	6·7	4·7	4·0
1926	2·7	3·0	2·0	1·4	8·6	8·7	6·6	4·1
1927	2·8	1·4	3·7	1·2	11·4	10·7	9·2	6·9
1928	4·1	4·3	4·4	2·2	9·1	9·8	9·7	5·5
1929	4·8	3·0	4·3	2·9	8·3	7·0	7·4	5·5
1930	0·9	—	2·7	—	3·2	—	5·8	—
1931	5·7	4·7	4·7	4·6	12·0	9·1	7·3	7·3
1932	3·2	4·7	4·8	3·0	9·8	14·5	11·1	8·0
1933	6·5	4·7	5·7	4·9	15·0	15·5	12·3	12·8
Mean 1925–33 (omitting 1930)	4·24	3·60	4·17	2·89	10·31	10·25	8·53	6·77

The rise in the diagram around 1929 is due to the good wheat crops of that single season, which will be considered in more detail later.

There is little need to discuss the yields in the individual years for the broad effects are clear. It may, however, be noted that twice a second corn crop (barley in 1904 and oats in 1913) was taken immediately after a wheat crop. In these years there was no appreciable difference in yield as between the tares and the mustard plots. The differences between plots with and without mineral manures were negligible and there is no ground for ascribing the difference between tares and mustard to any effect on the mineral nutrients for wheat.

The grain yields of wheat in the Stackyard experiment began at a lower level than those of the Lansome experiment. In the first two seasons the wheat gave about 18 bushels of grain or rather more than the permanent wheat with dung for nearly 40 years. The falling off was at first more rapid on the tares than on the mustard plots. After the experiment was redesigned in 1921 the grain yields remained about equal on the two sets, but both were extremely low. The straw yields were about equal in the early years, but after the rearrangement the mustard plots gave the lower yields.

The limed halves of the plots on Stackyard Field gave lower wheat yields than the unlimed ones, especially after mustard. It is impossible to say whether this is the result of a soil irregularity or an effect of lime on the green manures or on the wheat. At any rate, it is clear that the wheat failure is not caused by soil acidity.

In spite of the absence of replication of plots there can be no doubt about the main conclusions, *viz.* (1) that both green crops failed to maintain the fertility of the soil, as measured by the yields of the following wheat crop, and (2) that tares, far from increasing the fertility of the soil through the nitrogen absorbed from the atmosphere, allowed an even more rapid loss of fertility than did mustard.

In 1925 Dr. Voelcker wrote of " the invariable observation that the wheat crop looks excellent right through to early summer and then unaccountably drops off ". Some of the earlier records may be quoted. As early as 1895 it was reported that " at first barley following the tares undoubtedly looked greener and taller than that on the other plots ". In 1910 the " wheat after tares ploughed in looked, as usual, good at first, but later on it fell far behind the other two ". It was often noticed that the wheat suffered a check, especially on the tares plots, about May. Thus in 1913 " towards the end of April the plants turned very yellow in appearance, more particularly on the tares plot ". Sometimes the check was ascribed to excessive moisture (1920) and sometimes to drought (1914), but it was almost always observed. In 1924 the wheat " grew well right on to May, the wheat after tares looking decidedly better than that after mustard and being as good as, or even better than, any other wheat plot on the field. After this, however, came the usual falling off ". In 1925 the wheat on the Stackyard Green Manure plots was decidedly the best on the whole farm until about May. Such observations were made so frequently that there can be no doubt that the poor results, especially after tares, cannot possibly be ascribed to any adverse effect at germination or on the young plants throughout winter. The mere fact that the trouble was first noticed in late spring suggests some nutrient deficiency rather than any possible toxic action or physical effect on the soil. The yellowing might be taken to suggest a nitrogen shortage, but unfortunately this point was not tested directly until 1929 and 1930 when some small plots were laid out on wheat after the two green manures to test the effects of a nitrogenous top dressing (Ref. 5). The results in Table III clearly show that the unmanured wheat after mustard or tares was suffering acutely from nitrogen shortage. Top dressings with nitrate of soda doubled or trebled the yield.

TABLE III.

MICROPLOT EXPERIMENTS ON WHEAT AFTER GREEN MANURES.

(Stackyard Field.)

		Total Yields of grain+straw in cwt. per acre.			
Cwt. of nitrate of soda added per acre.		0	1	2	4
1929.	Wheat after tares .	15·3	20·4	22·0	—
	Wheat after mustard	15·9	21·0	24·9	—
1930.	Wheat after tares .	10·2	17·6	20·4	29·6
	Wheat after mustard	14·6	20·9	24·5	31·5

THE GREEN CROPS.

As the green crops were ploughed in or folded off as they grew there are no systematic yield data, but representative samples were taken for analysis in six seasons.

TABLE IV.

YIELD AND COMPOSITION OF GREEN CROPS.

	Dry Matter. Cwt. per acre.		Nitrogen. Cwt. per acre.		Nitrogen. Per cent. of dry matter.	
	Tares.	Mustard.	Tares.	Mustard.	Tares.	Mustard.
LANSOME FIELD.						
First Crops.						
1902 . . .	13·5	10·7	0·54	0·25	3·98	2·30
1903 . . .	36·6	30·0	1·46	0·49	3·95	1·80
1930 (old plots) .	22·2	7·8	0·53	0·09	2·44	1·17
1932 (old plots) .	4·5	3·1	0·10	0·07	2·11	2·20
Second crops.						
1930 (old plots) .	8·6	3·3	0·89	0·08	4·05	2·50
1932 (old plots) .	8·3	4·4	0·25	0·12	2·98	2·83
STACKYARD FIELD.						
First crops.						
1930 . . .	13·0	3·0	0·47	0·06	3·63	2·08
1931 . . .	15·2	7·2	0·57	0·15	3·79	2·10
1932 . . .	14·8	4·8	0·43	0·09	2·86	1·99
1933 . . .	14·0	9·0	0·47	0·15	3·30	1·71
Second crops.						
1930 . . .	11·8	4·9	0·51	0·14	4·30	2·87
1931 . . .	1·2	1·5	0·06	0·06	4·69	3·69
1932 . . .	0·8	2·2	0·03	0·07	2·96	2·23
Average of first crops only (both fields).	16·7	9·4	0·57	0·17	3·26	1·92

The results in Table IV show clearly that the tares generally gave a heavier crop than the mustard and further that it was much more highly nitrogenous. Unit dry matter had often nearly twice as much nitrogen in tares as in mustard. A considerable fraction of the nitrogen in tares must represent an absolute gain, for it comes from the air, whereas the mustard crop returns to the land only the nitrogen it has previously absorbed from the soil. As far as can be estimated from these data it may be said that, considering only the first crop in each season, the tares provided over three-quarters of a ton of dry matter per acre and the mustard about one-half of this amount; and that the tares contained over half a cwt. of nitrogen per acre (equivalent to nearly 3 cwt. of sulphate of ammonia per acre) and the mustard about one-quarter of this amount. In the Stackyard Field experiments the average amounts of nitrogen returned to the soil by the first green crops were equal to 0.57 cwt. per acre for tares and 0.17 cwt. per acre for mustard. To this must be added 0.10 cwt. of nitrogen per acre added as cake, and from it must be subtracted the amounts retained by the sheep or inevitably lost in evaporation of ammonia from the sheep manure. As a maximum, and neglecting the effects of the animals, the total amounts of nitrogen (0.67 cwt. per acre for tares and 0.27 cwt. per acre for mustard) are small. They are equivalent to about 3 cwt. and 1.3 cwt. of sulphate of ammonia per acre or 5 tons and 2 tons respectively of dung such as was used in the continuous wheat experiments. When it is remembered that these amounts of nitrogen were added in alternate years, whereas in the Woburn continuous wheat experiments 6 to 8 tons of dung per acre were used annually, it is difficult to agree with Dr. Voelcker in regarding the treatment as "liberal" or "in pursuit of what may ordinarily be considered good farming practice".

THE ORGANIC MATTER OF THE SOILS.

The amounts of nitrogen and carbon added in the green crops are but small fractions of the total amount of these elements present in the soil itself, and, in view of the inherent soil irregularities and the difficulties of sampling, it is difficult to follow the fate of added organic matter by direct analyses. The following Table V gives the available data which are taken from a thesis by Dr. Walkley (Ref. 6).

TABLE V.

SOIL ORGANIC MATTER IN GREEN MANURE PLOTS.

Field.	Year of sampling.	Depth of sampling in inches.	Tares Plot.	Mustard Plot.	Tares plot for mustard plot = 100.
		Carbon as per cent. of soil.			
Stackyard . .	1921	(?9)	0·97	0·99	98
	1929	6	1·04	0·96	108
	1932	9	0·98	0·86	114
Lansome (old plots) .	1921	(?9)	0·88	0·90	98
	1932	9	0·88	0·78	113
Lansome (new plots)	1932	9	1·13	1·06	107
		Nitrogen as per cent. of soil.			
Stackyard . .	1920	(?9)	0·114	0·098	116
	1921	(?9)	0·111	0·104	107
	1929	6	0·106	0·098	108
	1932	9	0·103	0·091	113
Lansome (old plots) .	1904	6	0·140	0·111	126
	1909	6	0·118	0·097	121
	1914	(?)	0·086	0·086	100
	1915	(?)	0·099	0·097	102
	1915	9	0·084	0·080	105
	1920	9	0·114	0·098	116
	1921	9	0·088	0·086	103
	1932	9	0·084	0·073	115
Lansome (new plots)	1932	9	0·108	0·098	110

The above figures show that the tares plots had consistently more nitrogen than the mustard plots, as would be expected in view of the nitrogen fixed by the tares. Although there are some irregularities and uncertainties about the depth of sampling, it is clear too that in spite of the organic matter returned in the green crops and the wheat stubbles, the plots lost carbon and nitrogen during the experiment. For Stackyard Field it is possible to attempt a comparison of the loss of organic matter (measured as nitrogen) in the green manuring rotation as compared with a four-course rotation (generally swedes, barley, clover, wheat) and with continuous wheat. The rotation plots, which originally formed the main feature of the Woburn experiments, received dung for the swedes in the early years and later the swedes were folded off by sheep receiving corn or cake. For some years clover was omitted. In 1911 one of the four series of plots was converted into the Stackyard green manuring experiment here discussed, and by comparing it with the other plots before and after the change one may form an estimate as to how the new green crop-wheat rotations affected the organic matter content of the soil (Table VI).

TABLE VI.

NITROGEN AS PERCENTAGE OF SOIL SAMPLED TO 9 INCHES.
(Stackyard Field.)

	Four-course Rotation Plots.				Continuous Wheat Plots.	
Year.	Rotation 1 followed by green manure experiment 1911–1932.	Rotation 3 1876–1932.	Rotation 4 1876–1932.	Year.	Unmanured 1877–1932.	with dung. 1877–1926.
1876 . .	0·157	0·142	0·166	1876	(0·156)[1]	(0·156)[1]
1886 . .	0·154	0·138	0·158	1888	0·138	0·171
1900 . .	0·134	0·122	0·151	1898	0·135	—
— . .	—	—	—	1927	0·109	0·145
1932 . .	0·096	0·103	0·115	1932	0·106	0·124

([1] from a single sample of the permanent wheat and barley area.)

It will be noticed that in 1876 before any experimental treatments were given the four sets of plots differed distinctly in their nitrogen contents and further that differences of the same type were maintained throughout the experiment. This is clear evidence of the stability and inertness of the bulk of the soil nitrogen. All plots, other than the one with dung annually to 1926, lost about one-third of their initial supplies of nitrogen by 1932. The soil of Rotation 1 had a nitrogen content intermediate between those of Rotation 3 and 4 for each of the three sampling dates when it was receiving the same treatment as these plots; but between 1900 and 1932, *i.e.* including the 21 years of the green manure experiment, it lost nitrogen more rapidly. The value given for 1932 is the average from the eight separate sub-plots in the experiment and the agreement between the individual values is sufficient to permit considerable confidence in this as a reliable value. (Table VII.)

TABLE VII.

NITROGEN AS PERCENTAGE OF SOIL IN GREEN MANURE PLOTS AT STACKYARD FIELD 1932.

Crop in 1932.	Tares.	Wheat after tares.	Mustard.	Wheat after mustard.
Limed half . .	0·105	0·104	0·092	0·088
Unlimed half . .	0·107	0·097	0·091	0·093

The green manures-wheat rotation appears to have caused more rapid loss of organic matter than continuous wheat or a four-course rotation.

THE INORGANIC NITROGEN OF THE SOILS.

In the seasons 1928 and 1929 Dr. Mirchandani made systematic determinations of the ammonia and nitrate contents of the soils from all of the green manure plots. His results (Ref. 5) afford further evidence of the acute shortage of available nitrogen. It happened that the wheat crops of 1928–9 were abnormally good on Lansome Field though normally bad on Stackyard Field. Further, on Lansome Field the tares plots gave a considerably higher yield of wheat than the mustard plots. On Stackyard Field in 1928 there were no second crops and the land was left as fallow during a wet summer and autumn, followed by an exceptionally cold and dry winter. On Lansome Field good second green manure crops were ploughed in immediately before the wheat was sown.

In both fields the nitrate contents throughout the winter and spring were very low (about 2 parts of nitrogen per million of soil) whereas the ammonia contents were unusually high for arable soil (about 8 parts of nitrogen per million of soil). The tares soil had more ammonia than the mustard soil and the Lansome plots more than the Stackyard plots. It is tempting to ascribe the good yield of wheat on Lansome Field to the circumstance that the low temperature slowed down nitrification and drainage at a time when the soil still contained the fresh residues of the recently ploughed-in green manures. On Stackyard Field decomposition and loss of available nitrogen must have proceeded far during the warm wet summer and autumn before the wheat was sown.

The observations on the wheat crop and the direct experiments on crops and soils of 1929 suggest that the essential problem of the Woburn green manure experiments consists in ascertaining the cause of the low availability of nitrogen in the spring following the green manure crop of the previous summer. This problem has been studied since 1929 at Woburn and Rothamsted by pot and laboratory experiments.

EARLY POT EXPERIMENTS.

Many experiments were made in pots from 1902 onwards at Woburn to compare the effects of different soil treatments on the yield of wheat grown in soil taken from the tares and the mustard plots respectively. They tested such questions as the effects of lime, magnesia, potash, and phosphate, the effects of adding various colloidal or clay-like materials and the effects of partial sterilization by heat or antiseptics. Few of them gave clear results and none revealed an undoubted difference in behaviour between the tares and the mustard soils.

There was some evidence of a response to lime, but when field tests were made it appeared that liming reduced instead of improving the yields. There was no evidence of any nutrient deficiency other than nitrogen and this was not followed up at the time. Here it will be sufficient in order to bring out the absence of any clear and consistent difference between the soils of the tares and the mustard plots to quote a few averaged results. (Table VIII.)

Table VIII.

EARLY POT EXPERIMENTS IN SOILS FROM GREEN MANURE PLOTS.

		Mean yields in gms. per pot.			
		Grain.		Straw.	
Year.	Soil from	Tares.	Mustard.	Tares.	Mustard.
	Experimental Treatment.				
1902	Nil	13·9	14·7	23·4	23·1
	Nitrogen added .	23·8	21·5	40·2	37·4
1909	Nil	17·4	25·2	33·3	43·4
	Nitrogen added .	41·9	46·5	62·8	71·2
1910	Silicates . . .	11·5	13·3	21·8	23·6
1923	(Stackyard) Nil .	13·9	8·3	20·3	14·0
	Lime .	19·9	20·3	33·3	28·7
	(Lansome) Nil .	11·8	8·3	18·6	17·7
	Lime .	23·8	32·4	27·2	36·1

The promising appearance in winter or early spring of the crops after tares and their collapse in early summer were observed in these pot cultures just as in the field.

In 1905 two successive crops of tares and mustard were grown in uniform soil (not from the experimental plots) and after weighing and sampling for analysis were turned in as manures for a wheat crop in the following year. When the wheat was sown a few weeks after incorporating the second crops it was noticed that " the buried tares had almost completely decomposed, only a few of the hardest pieces of the stem being undecayed. The buried mustard showed several stems of undecomposed plant in spite of the fact that in returning the green plant material to the soil, it was cut up and pounded in a mortar ". The yields of the green crops and wheat were, in gms. per pot:—

			Tares.	Mustard.
1905	Green Crops.	Organic matter in 2 crops . . .	35·1	26·8
		Nitrogen in 2 crops	1·06	0·60

			After tares.	After mustard.
1906	Wheat.	Grain	29·7	10·4
		Straw	45·1	15·0

These figures show that, as in the field, the tares returned the larger amount of nitrogen, but the results of the pot cultures are diametrically opposed to those of the field, for in the pots the wheat profited fully from the extra nitrogen gained from the air. As large amounts of green material were added shortly before the wheat was sown these results are sufficient to dispose of the view that tares might contain some substance toxic to wheat.

RECENT POT AND LABORATORY EXPERIMENTS.

When the subject was reopened in 1928 it was shown quite definitely that the wheat after green manures suffered from an acute nitrogen shortage ; the laboratory and pot investigations were therefore directed to ascertaining how the availability of the nitrogen present in tares and mustard material was influenced by the length of the interval and by the soil conditions during the interval between the adding of the green crops to the soil and the time when the wheat crop made its maximum demands on the soil. Most of the experiments were made on a uniform lot of soil taken from a part of Stackyard Field which adjoined the green manure experiments but which had never carried these crops. The pot experiments were conducted in a uniform manner in three seasons in deep pots provided with means for allowing free drainage of large amounts of added water as an experimental treatment. In order to study the availability of the nitrogen in the two green crop materials the amounts of tares and mustard applied as manure to the soil were chosen to provide equal amounts of nitrogen (generally 0·5 gram per pot). As the mustard used contained about 2 per cent. of nitrogen and the tares 4 per cent., comparable dressings of mustard were therefore twice as heavy, or provided twice as much carbon per unit of nitrogen, as the tares. All of the green crop materials were collected from the Stackyard Field plots just before the crops were considered ready for folding. The materials were air dried and ground very finely. Laboratory experiments showed that at least two-thirds of the nitrogen present in tares is converted very rapidly into nitrate. The rate of nitrification is comparable with that of dried blood and only slightly below that of sulphate of ammonia. Tares material must therefore be regarded as a very rapidly available source of nitrogen for plants, resembling a quickly acting soluble fertilizer rather than a slowly available organic manure such as dung. This explains its great merit when properly used and also its great liability to wastage and loss. Mustard material on the other hand gives no nitrate for several weeks and for even longer periods when soil conditions are unfavourable for decomposition. Indeed mustard actually removes nitrate from the soil in the first stage of its decomposition.

Mustard contains so much carbohydrate per unit of protein (or in other words has so wide a "carbon-nitrogen ratio") that the soil micro-organisms which destroy the carbohydrates find insufficient protein in the mustard itself and must draw on any other available nitrogen, such as nitrate, present in the soil. Gradually, as the excess of carbohydrate is burnt away or locked up in the bodies of micro-organisms, the drain on the soil nitrogen ceases and some of the nitrogen locked up is slowly liberated as ammonia and nitrate. Tares and mustard would thus be expected to provide nitrate in the soil at different rates. The fate of this nitrogen will depend on the nature and size of the crops growing in the soil and on the weather. If the plants are very small and the drainage considerable much will be washed down into the deep subsoil and some may be washed beyond the range of the roots of the growing crop. The pot experiments conducted from 1929 to 1933 provided comparisons of the effects of mustard and tares material used as manure at different times of the year and under conditions with or without free drainage from the pots at certain seasons.

In the 1933 experiment on barley the pots were set up at the end of January with manures giving a wide range of amounts of nitrogen in the form of sulphate of ammonia, tares and mustard. The soils were held at a suitable moisture content for crop growth for one month but no crop was sown. To half of the pots with tares, mustard or no nitrogen sufficient water was added at the end of February to wash through about 2 litres of drainage water per pot. When the soils had dried to a suitable moisture content barley was sown in all pots and given no further experimental treatment. Table IX gives the yields of barley grain, the total nitrogen content of the barley grain and straw and the amount of nitrate removed in the drainage water from the leached set. It will be seen that about 14 per cent. of the nitrogen added in tares was washed out one month after the addition whereas with mustard the nitrate in the drainage water was reduced to about one-half of that in the unmanured soil. The barley plants clearly received too much nitrogen from the higher dressings of sulphate of ammonia and from the highest one of tares. With these heavy dressings of available nitrogen the plants tillered abundantly late in the season and remained green when grain should have formed; large numbers of the flowers in the ears failed to form grain and the straw remained very rich in nitrogen. On the average nearly one-half of the nitrogen added as sulphate of ammonia was recovered in the barley grain + straw. In the unleached pots about one-quarter of the tares nitrogen and only one-tenth of the mustard nitrogen was recovered. In the leached pots the recovery was reduced from 26 per cent.

to 16 per cent. for tares and only from 10 to 8 per cent. for mustard. The experiment confirms the high and rapid availability of tares nitrogen provided that the nitrogen is used by a rapidly growing crop in the absence of much free drainage. These results and the conditions under which they were obtained are, of course, quite different from those of the field experiments.

TABLE IX.

BARLEY EXPERIMENTS 1933.

All results expressed as grams per pot.

Manures added January 26th, 1933.
Leaching (once only) on February 25th, 1933.

Amount of nitrogen added	0	0·25	0·5	0·75	1·0	Mean percentage recovery of added nitrogen.
YIELD OF BARLEY GRAIN.						
Unleached series.						
Sulphate of ammonia	7·6	16·6	19·2	16·1	7·7	—
Tares	7·6	12·4	16·3	20·2	19·5	—
Mustard	7·6	9·5	10·8	10·9	14·4	—
Leached series.						
Tares	6·4	9·7	10·8	15·9	19·8	—
Mustard	6·4	8·9	8·4	11·6	12·5	—
TOTAL NITROGEN IN BARLEY GRAIN + STRAW.						
Unleached series.						
Sulphate of ammonia	0·151	0·245	0·393	0·517	0·553	43
Tares	0·151	0·206	0·278	0·354	0·446	26
Mustard	0·151	0·205	0·221	0·235	0·255	10
Leached series.						
Tares	0·155	0·210	0·207	0·261	0·335	16
Mustard	0·155	0·197	0·208	0·231	0·242	8
TOTAL NITROGEN IN DRAINAGE WATER.						
Tares	0·068	0·123	0·165	0·193	0·202	14
Mustard	0·068	0·040	0·033	0·032	0·031	3

In 1929–30 similar experiments with a single rate of nitrogen application were made with winter wheat, which was sown on November 11th immediately after adding the green manure materials. The yields and the nitrogen contents of the wheat and of the drainage water are given in Table X. Six leachings were given to half of the series. The amount of nitrate in the drainage water fell off rapidly as the spring advanced, for the wheat plants removed nitrate so rapidly as the soil warmed up that there was little excess subject to loss by leaching. The tares pots lost more nitrogen and the mustard pots less nitrogen than the unmanured series, and in the unleached pots the tares gave a higher yield and the mustard a lower yield than the unmanured series. The wheat recovered nitrogen equal to 14 per cent. of that added as tares, but failed to recover any nitrogen from the mustard. In the leached series both tares and mustard gave similar small recoveries. Parallel with this experiment there were series in untreated soil taken from the tares and mustard plots of Stackyard Field at about the time the wheat was sown and two or three months after the green manures had been folded off. The grain yields were similar on the tares and mustard soils, but the wheat plants in tares soil contained much more nitrogen than those in mustard soil when both were not leached. Both soils, but especially the tares soil, lost much nitrate by leaching, and the nitrogen contents of the wheat plants were reduced by almost half on the mustard soil and by more than half on the tares soil by leaching. In the tares soil the difference in nitrogen contents of wheat for the leached and unleached was greater than the actual amount of nitrate leached away. The results resemble the field results in showing that the benefit from the green manures was very slight when the manures were allowed to decompose in the soil before leaching took place.

TABLE X.

WHEAT EXPERIMENT 1929–30.

Manures applied Nov. 11, 1929, six leachings between Dec. 30, 1929, and April 16, 1930.
Wheat sown, Nov. 11, 1929, harvested Aug. 18, 1930.
All results expressed as grams per pot.
Tares and mustard added at the rate of 0·5 gm. nitrogen per pot.

Soil	Normal.	Normal.	Normal.	From tares plot.	From mustard plot.
Addition . . .	None.	Tares.	Mustard.	None.	None.
Weight of wheat grain.					
Unleached pots . .	8·8	10·0	7·7	10·6	11·2
Leached pots . .	5·8	6·8	7·5	6·3	6·6
Total nitrogen in wheat grain + straw.					
Unleached pots . .	0·117	0·249	0·182	0·305	0·219
Leached pots . .	0·128	0·154	0·156	0·139	0·128
Reduction by leaching	0·049	0·095	0·026	0·166	0·091
Nitrogen in drainage water.					
From leached pots .	0·078	0·099	0·050	0·118	0·096
Percentage recovery of added nitrogen.					
Crop from unleached pots	—	14	1	—	—
Crop from leached pots	—	5	6	—	—
Drainage water from leached pots . .	—	4	-6	—	—

TABLE XI.

WHEAT EXPERIMENT 1931–32.

Manures applied April 2, 1931.

Leachings, eight between April 29, 1931, and Nov. 21, 1931, and/or four between Jan. 30, 1932, and April 2, 1932.

Wheat, sown Dec. 28, 1931, harvested August 22, 1932.

All results expressed in grams per pot.

Tares and mustard added at the rate of 0.5 gm. nitrogen per pot.

	Yield of wheat grain.			Total nitrogen and wheat grain+straw.		
Addition . . .	None.	Tares.	Mustard.	None.	Tares.	Mustard.
Not leached . .	4·8	6·6	7·4	0·113	0·175	0 188
Leached in 1931 . .	3·5	4·1	4·8	0·093	0·118	0·133
Leached in 1932 . .	3·3	4·3	4·2	0·087	0·115	0·124
Leached in 1931 and 1932	3·6	3·9	4·5	0·096	0·109	0·134

	Nitrogen in drainage water.			Percentage nitrogen recovery In drainage water.		Percentage nitrogen recovery In wheat grain + straw.	
Addition . .	None.	Tares.	Mustard.	Tares.	Mustard.	Tares.	Mustard.
Not leached . .	—	—	—	—	—	12	15
Leached in 1931 .	0·256	0·478	0·398	44	28	5	8
Leached in 1932 .	0·068	0·119	0·137	8	14	6	7
Leached in 1931 and 1932 . .	0·277	0·501	0·418	44	28	3	8

In the pot experiments of 1931–2 the manures were applied in April 1931 and the soils kept at normal moisture content for plant growth throughout the summer and autumn, but wheat was not sown until December 28th, 1931. During this period one-half of the pots were leached eight times and the drainage water analysed. In the first leaching tares gave more and mustard less nitrate than the unmanured pots. As the season went on the mustard pots gradually caught up and in the last few leachings were giving more nitrate than the tares pots. In the eight summer and autumn leachings from uncropped soil the total recoveries in the drainage of green manure nitrogen added to the pots were 44 per cent. for tares and 28 per cent. for mustard. With a long interval for decomposition a considerable fraction of the mustard nitrogen is converted into a form available either for the wheat plant or for loss in drainage. When the wheat plants were established one-half of the series of pots were leached four times. The nitrogen in the drainage was much below that in the summer drainage water, partly because the wheat plants were removing nitrogen from the soil water and probably too because some of the nitrogen had either escaped as gas or had been converted into relatively inert forms. The final wheat plants were poor, especially in those pots which had been leached. Even from the unleached pots only 15 per cent. of the nitrogen in tares and 12 per cent. of that in mustard were recovered in the wheat. The recoveries from the leached plants were much lower. In all four series of trials mustard gave better results than tares.

This pot experiment thus reproduces the essential features of the field experiments—poor wheat yields and worse yields after tares than after mustard. The experiment has too this feature in common with the fields that a lengthy interval elapsed between the incorporation of the manures with the soil and the time in the following spring and early summer when the wheat plant made its maximum demand on soil nitrogen. Washing out of nitrates during the winter will account for some of the loss, but the experiments in unleached soil show that this is not the whole story and that there must be some other loss of available nitrogen. Unfortunately the current methods of sampling and analysing field soils are not adequate to determine how this loss takes place. The total amount of nitrogen added in the green manure crop grown at Woburn is only a small fraction of the total nitrogen in the soil. Further, the actual depth at which wheat absorbs nitrate at different growth periods is not known. In loam and clay soils with pronounced structure, *i.e.* in well-drained and well-aerated soil with drainage channels and abundant cracks between lumps of more compact soil, it is clear that not all nitrate washed out of the surface is lost to the plant, and there is good ground for believing that relatively large amounts are stored up in the deep subsoil. Slow downward movement of water allows nitrate and other soluble nutrients to diffuse through the subsoil mass whereas the abundant drainage in very wet spells will pass chiefly through the main drainage channels and cracks. Thus the stored nitrate will be lost quite slowly from soils with good subsoil structure. In light sandy soils, however, there is much less structure and the drainage water in percolating through the whole mass of soil will carry away a much larger fraction of the nitrate which leaves the surface layers.

CONCLUSIONS.

Summarizing the whole of the investigations it may be said that the two-course rotation of summer green crops and winter wheat is an unsatisfactory one on light soils. The wheat fails to benefit from the nitrogen fixed by tares. So long as the soil remains in a moderate state of fertility mustard is more successful than tares in maintaining the fertility. There is no evidence that the failure of wheat is due either to toxic residues or to bad physical effects. The recent experiments bring out essential differences between tares and mustard. Tares material behaves almost as if about one-half of its nitrogen is in the form of an artificial fertilizer such as sulphate of ammonia, and when this is remembered the failure of winter wheat after a rapidly available nitrogenous fertilizer applied several months before the wheat is sown becomes less remarkable. Mustard decomposes more slowly. When the mustard is ploughed in immediately before the wheat is sown some of its nitrogen may be locked up so firmly that it becomes available too late for the wheat. When, however, mustard is ploughed in, in the previous summer, whilst the soil is warm and moist, the mustard may decompose so far that the nitrate formed may be lost in winter. In addition the possibility remains that in the decomposition of green manures some of the nitrogen may escape as gas.

It may safely be concluded that tares may be regarded as a means of converting some atmospheric nitrogen into a readily available form which, on light soils, will be liable to much loss unless it can be followed by a crop capable of absorbing nitrogen rapidly. Winter wheat is an unsuitable crop for this purpose because it grows too slowly during winter to remove much of the nitrate before the winter drainage carries it away. Mustard cannot take nitrogen from the air, but it absorbs soil nitrate and converts it into an organic form which will decompose relatively slowly in the soil. The nitrogen in mustard is accompanied by so much carbohydrate that the immediate effect of ploughing in mustard will be a further removal of nitrate from the soil with the formation of more organic nitrogen, capable, for a time at least, of resisting loss by drainage. It must, however, be remembered that in the field all crops require cultivation of the soil and leave it exposed with little cover for a month or two. These cultivations cause active decomposition of other organic matter, especially when the soil is warm, and allow considerable opportunity for loss of available nitrogen unless the green manure crop grows rapidly and well. The apparently adverse effect of lime in the Stackyard Field green manure experiments is probably due to a more rapid decomposition and greater loss in the limed than in the more acid soil. Poor, slowly growing crops may allow great losses of available nitrogen from the soil and the final crop may itself be too small either to add or to lock up even temporarily an appreciable amount of soil nitrogen. Green manure crops must be good ones before they can be useful ones; an indifferent green manure crop may be little better than a fallow and a fallow on light soil has little value apart from weed destruction. A large mustard crop grown rapidly in soil of moderate to high fertility provides a means of avoiding loss by carrying over some of the soil nitrogen and other nutrients to a later period when they may be utilized by some more valuable crop. A good crop of tares provides a direct addition of nitrogen in a form which becomes available at once. Whether it is used or lost depends on the immediately following crop and weather. The recent work confirms and explains an old farming practice known to Arthur Young, who wrote in 1815 in *The Farmer's Calendar* that "A good crop of winter tares leaves the ground in such loose, putrid, friable order, that it is better husbandry to sow turnips or plant cabbage on it, than to leave it to receive tillage for wheat".

The whole art of successful green manuring on light land lies in careful adjustment of the cropping so that the nutrients in the green manures will be efficiently used by the following crop.

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THE DISPOSAL OF SUGAR BEET BY-PRODUCTS:

SHEEP FATTENING ON SUGAR BEET TOPS.

IN this Journal last year there was published a report of experiments at the Norfolk Agricultural Station, Sprowston, on the feeding of sugar beet tops to fattening cattle (Ref. 1). A similar investigation has been carried out with fattening sheep. Manurial residue trials, after various methods of beet top disposal, are still in progress.

The trials, collectively, were designed to indicate the value, in farm practice, of sugar beet tops as a substitute for the usual stock-feeding roots, swedes and mangolds. It was assumed that the sugar beet crop would in course of time be established as occupying a part—probably the greater part—of the root area on suitably situated farms. The sheep feeding trials were started in 1930–31 and were repeated in each of the following two years. The results are now available and form the subject of this report.

Actually until Wood commenced to experiment on his Saxlingham (Norfolk) farm, no attempt had been made to assess in the field the value of beet tops to the English flockmaster. Wood's trials were repeated in 1927–28, but owing to his death the results of the second year were not published. The Norfolk Agricultural Station trials were intended to supplement Wood's trials, in which the writer and his colleagues co-operated (Ref. 2).

When tops are sheeped there are several obvious advantages : collecting and carting are avoided, damage to the soil texture is thereby minimized, the chemical fertility of the land is at least maintained, and the value of the tops is cashed much earlier than when they are used merely as manure. On outlying farms and awkwardly situated fields, folding is the only possible alternative to ploughing the tops in, while to the mechanized farmer the combination of beet and sheep-folded tops represents, in all probability, the most certain means of maintaining corn yields without recourse to the straw yard and the manure cart.

But before beet tops are made an integral part of a system of sheep feeding it is necessary to examine them in the light of existing practices and standards. Then, provided the result were satisfactory, sugar beet top feeding might be introduced into the flockmaster's calendar, and, instead of growing crops specifically for sheep feeding, lamb and mutton would be produced thereafter from a by-product, the main crop—sugar beet—having been cashed some time before. The roots to be replaced would be those normally grown for feeding between mid-October and early January ; the white turnip and possibly some of the swede acreage would be curtailed.

It was not to be expected, however, that the practice of beet top feeding would prove as easy as, say, swede feeding.

Three experiences may be quoted in this connection. Wood estimated that one-third of the tops were wasted during feeding. Is this general ? Again, of fifty sheep bought on Norwich market, three died within a week, and on post-mortem excessive sand in the intestines was diagnosed as the cause of death. The sheep had been on beet tops. Were the latter the cause of the trouble ? Heavy losses of in-lamb ewes were reported (Ref. 3) amongst sheep folded on beet tops. The ewes were found cast on their backs and very inflated. Again, were the tops to blame ? No method except trial in the field can throw light on such factors as these.

THE TRIALS OF 1930–33.

At the start there were 25 sheep in each pen each year, one pen being fed on beet tops and the other on swedes. A ration of hay and concentrates was given. The tops and swedes were fed in the morning and evening, the hay, cake and meal in the evening. The basis of the rations was Wood's Standard (Ref. 4) for fattening sheep ; the sheep were expected to put on 2 lb. live-weight increase weekly, and the rations were modified from year to year according to the variation in dry matter of the bulky foods.

It is, of course, quite easy to calculate rations in this way, but the results may be entirely vitiated by the failure of the sheep completely to consume the whole ration. This difficulty becomes more acute when bulky foods, such as swedes and beet tops (in particular) form the basis of the ration. In Wood's trial the tops were fed in situ and so much wastage occurred that deduction from the results was only made after much thought and hesitancy. Moreover, Wood's sheep, folded on whole tops, showed a preference for the leaves, and discarded the crowns. This, incidentally, is not general with stock and the reverse was the experience in bullock fattening trials at Sprowston. In the Sprowston sheep fattening trials, however, it was considered necessary to persuade the sheep to eat the crowns as well as the leaves, and the method used in the 1928–31 bullock feeding trials was adopted : the tops were chopped before feeding into two or three pieces with a turnip "hook." While this method did not entirely prevent wastage it was the best that could be done under field conditions. Weighing the discarded tops was useless owing to the water added by the sheep during feeding, and dry-matter determinations to overcome that difficulty were equally ineffective, because of the sand added during feeding. Wastage and almost continuous variation in the moisture content of the tops make all sheep feeding trials with beet tops, no matter how carefully they may be carried out, of problematical value to the scientific worker whose results must be accurate to a degree. But they do not detract from their value to the sheep feeder, whose practice is conducted under precisely the conditions which hold during trials in the field.

The folds, which were 16 yards square, were moved every two days ; each sheep was numbered with a metal disc wired to the wool ; weighings were made, as nearly as possible, at intervals of three weeks, but occasional delay was necessary after a wet day or series of wet days. The trials lasted 56, 55, and 41 days respectively in the three years and started in each year in the last week of November (actually 1st December in 1930). The sheep were fed on the trial rations for two weeks before recording began. They were Cotswold x Suffolk crosses except in 1932, when they were Oxford x Suffolk. The rations were as given in the following tables :—

BASAL RATION IN EACH OF THREE YEARS.
LB. PER SHEEP PER WEEK.

	1930–31	1931–2	1932–3
Hay	5	5	5
Feeding Chalk	2 oz.	2 oz.	2 oz.
Decorticated groundnut cake	1	1	1
Rolled barley	1½	—	—
Rolled oats	1½	—	1
Maize meal	—	3	1

SWEDES AND TOPS FED IN EACH OF THREE YEARS.
LB. PER SHEEP PER WEEK.

			Containing Dry Matter	
	Swedes.	Tops.	Swedes.	Tops.
1930–31	112	98	13 lb.	16 lb.
1931–32	153	112	15 „	20 „
1932–33	182	112	15 „	19½ „

In view of the suggestions contained in a recent paper (Ref. 5) that Wood's sheep fattening standards are too liberal, it will add interest to this report to give the weekly starch equivalents and digestible protein figures in each of the three years. They were compiled from analyses given in Wood's Rations for Livestock, and from dry matter analyses of the swedes and tops actually fed. The calculations are given in lb. per sheep per week.

	Initial live weight of sheep.	Swedes.		Tops.	
		Starch Equivalent.	Digestible Protein.	Starch Equivalent.	Digestible Protein.
1930–31	80 lb.	12·0	1·5	12·2	1·9
1931–32	120 „	14·7	2·1	15·0	2·3
1932–33	120 „	14·0	2·1	13·8	2·1

THE LIVE-WEIGHT GAINS.

A discussion here on sheep feeding standards would be out of place (since the trial was a comparison of the feeding value of beet tops and swedes) and the data are only given for those interested in the subject. Actually the sheep with the exception of one lot, *viz.*, that fed on tops in1931, either equalled or exceeded the predicted live-weight increase, which was 2 lb. per sheep per week.

This is shown below :—

WEEKLY LIVE-WEIGHT GAINS PER SHEEP IN EACH OF THREE YEARS.

	Fed on Swedes. lb.	Fed on Beet Tops. lb.	Difference. lb.	Standard Error. lb.
1930–31	2·98	2·0	0·98	0·19
1931–32	2·62	1·47	1·15	0·24
1932–33	2·39	2·15	0·24	0·24
Whole Period . . .	2·66	1·87	0·79	0·15
Total number of sheep at end of trial . .	70	70		

A broad inference is at once possible : in the quantities fed beet tops did not equal swedes as a food for fattening sheep. Those fed on swedes increased in live weight by at least ¾ lb. more per week than those fed on tops. Since the rations were adjusted to the same food value, there must be some factor or factors (to which there is later reference) preventing the full food value of the beet tops from being recovered. Wood fed 145 lb. of swedes and 93 lb. tops weekly and the difference in favour of the swede feeding was ·82 lb. live-weight increase weekly, which is very close indeed to the mean (·79 lb.) in the Sprowston trials.[1] To make up the deficiency and to finish sheep as quickly on beet tops as on swedes it would be necessary to feed extra concentrated food. Viewed scientifically the loss of ·79 lb. of live-weight increase should be recoverable by feeding an extra 2½ lb. of maize meal weekly to each sheep, for it is unlikely that heavier rations of beet tops than those fed in the trials would be consumed. The differences in the live-weight increases of the sheep on swedes and those on tops, although a valuable practical guide, can only be approximate on account of the variable results obtained in the last year. While, therefore, it is true that sheep in the trials fed on beet tops each put on ·79 lb. live weight less than sheep fed on an equivalent ration of swedes, that will not necessarily be the invariable experience.

It is in the early stages of sheep feeding, when the sheep first go on to the tops, that the superiority of swedes is most marked. This may be illustrated by reference to the differences in live weight at each weighing period stated in simple statistical terminology.

DIFFERENCE IN LIVE-WEIGHT INCREASE OF SHEEP FED ON SWEDES COMPARED WITH SHEEP FED ON TOPS.

	1st period.	2nd period.
1930–31 . . .	Significant	Significant
1931–32. . .	Significant	Not significant
1932–33. . .	Significant	Not significant

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[1] In a letter to the writer, Wood stated that the beet tops had done better in the second year of his trials, and that the starch equivalent worked out at just over 9 lb. per 100 lb. of tops.

This means that the difference in live weight recorded between the sheep in the early stages of feeding were definitely due to swede superiority, and not to any other cause or chance error in experimentation. It is different in the last period. Although the swede records are still the better of the two the difference is not large enough for the statistician to say with certainty that swedes then proved a better sheep feed than tops. There are, of course, a number of factors which may be associated with the general failure of beet tops to come up to the expectation based on their analysis; adhering dirt, scouring due to the oxalic acid in the beet, urethral troubles in the male sheep, rotted or frozen tops or wastage during feeding, may all be contributing causes. Actually there were no urethral difficulties during the trial, neither was there much rotting or scouring, the wilting and the feeding of chalk proving fairly effective preventives; but it is almost impossible to avoid wastage and adhering dirt. Sand will cause deaths in sheep and it is only reasonable to conclude that soil, especially sandy soil, present in quantities, insufficient to be fatal, may still cause some intestinal irritation, which may interfere with digestion, with the efficiency of the beet tops and perhaps of the whole of the ration. On the other hand the fact that sheep on beet tops so nearly attained the predicted live weight increase (1·87 lb. instead of 2 lb. weekly), is sufficient testimony to their practical value as a food for sheep, and to indicate the great part which the beet crop may be made to occupy in sheep farming. The general considerations in the handling of beet tops to ensure the cleanest type of feed have been previously outlined (Refs. 1 and 3); but the importance of spreading the tops evenly about the new folds so as to freshen them and remove some of the dirt, cannot be over-estimated. They are then a much more palatable food than when fed direct from the rows left after topping.

As the sheep were on the tops, on the average, for no more than 51 days it was impossible to finish them and so to obtain an impression of the carcase values. In the first two years they were sold immediately the trial ended, but in 1933 fattening was completed at Sprowston, beet pulp being substituted for the roots and tops. Although it would be unwise to attach too much importance to the result, the first sheep drawn for market were, to a great extent, those previously fed on beet tops, and the last draft of all contained most sheep previously fed on swedes.

DISCUSSION.

Throughout each of the reports of this series there has been in mind the possible replacement of roots by sugar beet. From these feeding trials it is possible to forecast with some accuracy the effect of such a replacement on sheep feeding policy. To do so it is only necessary to calculate the weight of swedes which proved equivalent to 1 ton of tops ; when this is done the results are :—

1930–31.	1 ton tops equalled in feeding value	·76 ton swedes.
1931–32.	" " " "	·78 " "
1932–33.	" " " "	1·46 " "

Mean of 3 years—1 ton tops equalled in feeding value 1·0 ton swedes.

Wood's 1926 trial assessed the swede value of 1 ton of tops at 1·08 tons and, calculating from his letter on the subject of his second year's trial, 1 ton of tops then equalled 1·23 ton of swedes. If the mean of these two results is taken with the three contained in the table immediately preceding, 1 ton of tops is equal in feeding value to 1·05 ton of swedes.

Woodman and Bee (Ref. 6), however, carried out more accurate tests with clean beet tops, in which no wastage was permitted during feeding to sheep under laboratory conditions. Then 25 lb. of tops equalled 40 lb. of mangolds and the starch equivalent of beet tops was calculated as 8·55. The starch equivalent of swedes is 7·3 and a simple calculation shews that Woodman and Bee's ton of beet tops is equal to 1·16 ton of swedes. Wood's figures and those above suggest that the feeding values to sheep in the field are almost equal, weight for weight, but the disagreement with Woodman and Bee is small and wastage during feeding undoubtedly explains part of it.[1] Wood, as already mentioned, estimated the wastage at one third of the yield of tops. Observations on a number of Norfolk sheep farms (Ref. 7) show that it may be anything from 10 to 40 per cent. In other words, management enters largely into the extent to which Woodman and Bee's scientific figures are approached in the field.

It might be argued that more successful management in the last year of the trial was responsible for the better results obtained. In that year 1 ton of tops was equal in feeding value to 1·46 ton of swedes. The tops in 1932–33 were not, however, markedly different in analysis from those grown in the two previous years ; neither, in fact, was there less wastage in the last year. There is, however, a possibility that a comparison between swedes and tops will give different results according to the weights fed. A heavy ration of roots or tops

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[1] The varying dry matters also make the comparison difficult. They were :—

	Swedes.	Tops.
Woodman and Bee .	11·5	16·2
Sprowston . .	8·3 to 10·1	16·0 to 19·6

If this factor is brought into the results it increases the disagreement to a small extent.

may have a depressing effect on the appetite and hence, presumably, on the live-weight increases of the sheep. In 1932–3 the swedes were much poorer in quality than in any other year. For that reason it was necessary to feed a much heavier ration of swedes in 1932–33 in order to equal the total feeding value of the tops. This may partly explain the inferior swede performances and consequent increase in the comparative value of tops. Weather and rainfall, too, exert an influence on the feeding of beet tops. In a wet season there is earlier and more complete rotting which is intensified if frosty weather follows a wet period. Whether there is any significance or not in the association, the fact remains that in 1932–33 when the sheep did so much better than in 1930–31, the rainfall from mid-November to mid-January was only 2·17 inches, in contrast with 4·07 inches over the same period in 1930–31. In 1932–33 the tops were in perfect condition throughout the trial, for the weather was ideal, not only for preserving the tops but for the sheep underfoot, and no decaying tops were fed. There was also less tendency to scour in 1932–33. Actually there were more frosty days in 1932–33 but they were dry frosts and not nearly so disastrous to the keeping qualities of the tops as frosts following rain.

But in spite of the conclusion (from the 1932–33 results) that, with good management, and good weather, a ton of tops will prove much better than a ton of swedes, it would be unwise to rely upon more than that equivalence in planning a sheep-feeding programme. When the replacement is considered in terms of acreage instead of tonnages, less precision is possible, for yields of beet and beet tops are variable from year to year. However, to take an extremely simple illustration; if the yield of beet tops available for feed is 7 tons per acre and swede yields are of the order of 14 tons per acre, then each acre of beet tops will provide sheep feed equal to half an acre of swedes. Or if a 14 ton crop of swedes will keep 100 sheep for two weeks, a 7 ton crop of beet tops will keep them for one week. Of course, practical experience in this respect varies enormously, but from data collected on a number of Norfolk farms it would usually seem to be safe to allow 100 fattening sheep per acre of tops per week: if anything this estimate errs on the side of caution.

As for the crops which the tops are to displace, they must be those grown for feeding between October and January—the lifting period of the beet. In exceptional cases, such as drought and consequent shortage of sheep feed in September, sheep have been successfully folded on beet tops before lifting, and tops in exceptional years have been safely fed as late as mid-February; but these are exceptions, and 12–14 weeks' sheep feed is the utmost that can be expected. During that time all classes of sheep can be folded on tops. This report shows that fat sheep can be fed upon them with safety, and where an arable breeding flock is kept the ewes may run on beet tops from the start of beet lifting until lambing in January, with little more than a good supply of hay and a run-out to grass. The prospect of "cheap food" from the beet crop is indeed a reality and is one of the minor and less advertised benefits which have made the new crop so important in Norfolk arable farming.

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SUMMARY.

1. The feeding values of sugar beet tops and of swedes were compared in sheep-feeding trials repeated in each of the years 1930–31, 1931–32 and 1932–33.

2. When fed in rations of presumed equivalent feeding value the beet tops did not equal the swedes. The average live-weight increases per sheep per week were 2·66 lb. on swedes and 1·87 lb. on beet tops.

3. The rations were expected to produce 2 lb. live weight increase per sheep per week. The sheep fed on swedes considerably exceeded that expectation but those receiving tops did not quite attain it.

4. It proved impossible, in feeding practice, to recover the whole of the feeding value of the beet tops, but in round figures 1 ton of beet tops equalled in feeding value 1 ton of swedes.

5. The Sprowston results are similar to those obtained in the earlier trials of Wood at Saxlingham, Norfolk, in which a ton of beet tops fed to sheep equalled 1·13 ton of swedes.

6. Sugar beet tops are a valuable sheep feed and may usually be relied upon for fattening sheep from the start of beet lifting until the beginning of January.

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APPENDIX.

1. AVERAGE WEIGHT PER SHEEP IN EACH YEAR.—LB.

	1930–31			1931–32			1932–33		
	1st Dec.	5th Jan.	26th Jan.	14th Nov.	18th Dec.	8th Jan.	29th Nov.	19th Dec.	9th Jan.
Fed on tops	79½	97½	95½	117	122	128½	117½	121	130
Fed on swedes	77	98½	100½	117	128	137½	118	125	132

2. AVERAGE GAIN PER SHEEP PER WEEK IN EACH YEAR.—LB.

	1930–31		1931–32		1932–33	
	1st 5 weeks.	2nd 3 weeks	1st 5 weeks.	2nd 3 weeks	1st 3 weeks.	2nd 3 weeks.
Fed on tops	3·5	–0·6[1]	1·0	2·2	1·3	2·9
Fed on swedes	4·3	0·7	2·2	3·2	2·4	2·3
Difference	0·8	1·3	1·2	1·0	1·1	0·4
Standard Error	0·17	0·43	0·33	0·41	0·32	0·40

[1] *i.e.,* during this period the tops-fed sheep lost weight.

3. PERCENTAGE OF DRY MATTER IN TOPS AND SWEDES IN EACH YEAR.

	Beet Tops.			Swedes.		
	1930–31	1931–32	1932–33	1930–31	1931–32	1932–33
November	—	17·7	17·4	—	9·7	8·3
December	—	19·5	16·0	—	9·0	9·2
January	16·0	19·6	19·1	9·5	10·1	9·2

FARM CROPS.

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I.—INTRODUCTION.

THE greater part of this article is confined to research work dealing with the cereal crops. It would be impossible to consider adequately all phases of crop improvement in an article of this length. To attempt it would be unsatisfactory to reader and compiler, and also unfair to the research workers. It was therefore deemed preferable to give a more or less full and connected account of recent work in connexion with the improvement of cereal cultivation.

Improvements by the introduction of new and improved varieties are necessarily slow. The plant breeder has to wait upon the pathologist, physiologist, and chemist, before he can be sure of his ground. Breeding blindly or in the optimistic hope that something good will eventually materialize is a hopeless procedure. Even when the breeder feels more or less confident of his material, the work is slow and full of pitfalls. Many years are required for placing a new variety at the disposal of the farmer, for the technique of hybridization and selection cannot be hurried. In the meantime new discoveries are being made in other branches of agricultural science, which often demand a radical change in the plant breeder's programme if he is to take advantage of the most recent findings. He is constantly on shifting ground.

In the last year or so the most important work in cereal improvement has undoubtedly been due to the pathologist and the physiologist, and it is this work which is dealt with fully here.

The concluding section on fruit breeding investigation has been included to elaborate upon, and bring up to date, the references made to sterility and incompatibility in this journal in 1926. The importance of the work to fruit growers is obvious, and few branches of genetic and cytological research have yielded such results of direct practical importance.

II.—PHOTOPERIODISM.

The effect of the length of the daily light period to which a growing plant is exposed has a radical influence on its vegetative and reproductive phases of growth. All plants pass through a longer or shorter growing period prior to flowering and the setting of seed. Garner and Allard (Ref. 1 and 2) were the pioneers of investigation on the subject of the effect of lengthening or shortening the normal daylight period on the developing plant. They investigated many species of plants and found that they could be included in one of two groups according to their response to varying light conditions. The one group they called "short-day": plants in which the flowering or reproductive stage is accelerated by exposure to a relatively short daily light period, and delayed or inhibited by exposure to a long daily light period. The second and smaller group of plants has the reproductive phase accelerated by long daily light exposure and delayed or inhibited by a short period: these are "long-day" plants. Subsequent workers have found plants which do not react to differences in length of day, constituting a third group.

It is important to realize, though, that response to varying length of day is not a simple reaction to this one factor. Temperature, humidity, and aeration, all affect the so-called photoperiodic reaction, but length of daily light exposure is probably the most important single factor modifying the development of the plant, and temperature modifies the light reaction to the greatest degree. Finally, the general nutritional conditions of the plant affect its growth relationships fundamentally.

The subject has become very complicated and technical, and the theoretical controversial points cannot be entered into here. (For a full bibliography of earlier works on the subject see Tincker (Ref. 3).) In recent years agricultural research workers have taken up the cudgel and the question of controlling the environment for all kinds of cultivated crops has been studied. Any understanding of the factors that affect plant development, particularly in relation to the vegetative and reproductive phases, is of vital importance to all growers.

Stapledon (Ref. 4) found that strains of grasses from different latitudes have a differential response to length of day. Thus at Aberystwyth strains of *Dactylis glomerata* (Cocksfoot) from high northern or from high southern latitudes are leafy, more persistent, and later flowering, than strains from nearer the equator. Williams' work (Ref. 5) with *Trifolium pratense* (Red Clover) has shown a similar state of affairs. The importance of strain in pasture plants is thus of significance in that the place of origin will determine all the important agricultural properties as they are affected by length of day.

Forster, Tincker, Vasey and Wadham (Ref. 6) in an interesting paper on the photoperiodic response of wheat varieties lay stress on the essential modifying function of temperature. They found that length of day and soil temperature exert their influence before jointing or shooting commences. They maintain, as others have done, that there is no sharp dividing line between long-day and short-day plants, as the response of wheat differs with the variety. Wheat is generally regarded as a long-day plant, but spring and winter varieties react very differently. Length of day undoubtedly affects the longevity of the plant, and a variety may behave as an annual or a biennial according to the time of the year at which it is sown. This is well illustrated by the fact that winter varieties of cereals if sown in early spring will produce ears in the current growing season. There is a critical sowing date, varying with locality and variety, later than which it is useless to sow winter varieties because they will not ear until the following spring. The same consideration holds for spring varieties, but they can be sown up to a much later date than can the winter varieties. In fact, at Cambridge a certain Australian variety of barley sown at the beginning of June produced ears in 32 days. This is exceptional, however, and no English variety could be sown so late.

The photoperiodic reaction of varieties of agricultural crops is most important in selections for definite localities. In this country this consideration is not of vital importance because our arable crop area does not spread over many degrees of latitude, but it is of fundamental importance in restricting the introduction of new varieties from other countries. Horticulturists can utilize artificially controlled daily light for producing flowers and fruits out of season, or for inducing flowering in exotic species of decorative plants. Increasing the daily light period by means of electric light is quite within the scope of commercial fruit and flower growing. It is necessary sometimes to utilize light of high intensity. This is a much more expensive process, and probably not economic at the present moment.

For the plant breeder the artificial control of environment by light, temperature, and other factors, offers enormous possibilities. It is often difficult, or impossible, to cross-fertilize two varieties which differ greatly in their time of flowering. Sometimes this may be overcome by sowing the later variety abnormally early, and the early variety abnormally late. This process is not always successful, however, and it may be necessary to manipulate artificially the length of daily light exposure to ensure flowering at the same time. This has been done by plant breeders with crops such as maize, and herbage plants. Finally, by using electric light it is possible to induce reproduction in the short days of winter time. This may mean the saving of a whole year in breeding work, thus accelerating the production of new varieties which is such a slow process in northern latitudes such as ours.

But still further practical applications of photoperiodism have been evolved. If short-day plants are grown for some days under conditions of long daily light exposure, and are then transferred to short-day light influence, their transition to the reproductive stage is retarded. Conversely, if the plants are exposed to short-day conditions temporarily, and are then transferred to long-day treatment, the preliminary short-day exposure stimulates reproduction, so that the subsequent long days do not retard flowering.

The vital point to consider in the developing plant is that each stage of development requires, or may require, a definite set of external conditions for its successful fulfilment. In cereal crops the important consideration is the passage from the vegetative to the reproductive stage. Continuous illumination is most suitable for wheat, and it merely tolerates the alternation of long days and short nights; for short-day plants continuous darkness is best, but the plant can reproduce itself under conditions of short days and long nights.

Under normal conditions of growth it is impossible to supply a plant with continued darkness or continued light. Further, any plant would die if grown for a week or more in complete darkness. Lyssenko (Ref. 13) therefore conceived the idea of exposing the plant to the necessary light stimulus when in the extremely young seedling stage, during which time it is living on the food stored in the endosperm or the seed leaves. "When the stages which require darkness are passed, the plant obtained from such treated seed can be grown not only under long-day conditions, but even under constant illumination." Lyssenko has opened up a vast new field for investigation and we will now go on to consider the work already done in Russia and what its agricultural implications are.

III.—VERNALIZATION.

"Vernalization" is a new word coined to describe the most important work elaborated by research workers at the Odessa Plant Breeding Institute in Soviet Russia. It is an entirely new branch of agricultural research, and no work has been done in this country on the subject. Whyte and Hudson (Ref. 16) have produced a bulletin on the Russian work in which they have summarized it.

The process of vernalization was originally conceived by Lyssenko (Ref. 15) in 1931. It is essentially a pre-treatment of seed which obviates the necessity of early spring sowing in localities where this is impossible or where climatic uncertainties endanger the successful growth of the crop. All the advantages of early spring sowing can be attained without the actual sowing of the crop. In many continental climates, and in northern latitudes, autumn sowing of cereal crops is impossible, as the land is frozen hard and perhaps buried under several feet of snow. Sowing in spring is also not possible until the land has thawed out. Further, early autumn frosts may damage a late ripening crop. This means that the growing season is very short. In addition, high temperatures combined with excessively dry conditions often occur just at the period when the grain is setting and considerable reduction in yield is the result. Therefore, any process which will shorten the life cycle of the crop will mitigate these dangers. Only varieties which have a short life cycle can be grown under such conditions. Sowing in spring is late, and harvest must be early.

Vernalization aims at shortening the time necessary for a plant to pass through all the phases of its life cycle to the ripening of the grain. Now, although some varieties require a longer period than others for the production of the ripened grain, this period is by no means constant under all conditions, but it varies with the growing conditions. The length of day is the most important factor affecting the length of the life cycle (see Photoperiodism), but the whole of the climatic factors must be taken into consideration. Different plants, *e.g.* wheat, oats, barley, require different conditions for the maximum shortening of the life cycle, while different varieties of any one cereal are likewise individualistic in their requirements. Thus, the cultivation of any crop in a particular locality is dependent on its climatic requirements falling within the limits of the climatic environment of that locality. Further, the introduction of new and improved varieties into any area is similarly conditioned by these climatic considerations.

All plants pass through distinct phases of development from germination to the setting of seed. For example, the cereal plant establishes its root system, tillers, shoots or joints, flowers, and sets seed. It is usual to describe the development of the plant broadly in two phases—the vegetative and the reproductive, and it is the transition from the former to the latter that is of fundamental importance in the growing of any crop for its seed or fruit. Further, it is this transition that is so sensitive to environment. A plant may grow satisfactorily vegetatively in a locality, but it will not pass into the reproductive phase, and it is with this transition that vernalization is concerned.

The process of vernalization is merely the pre-treatment of seed to expose it to the conditions necessary for transition to the reproductive phase. This will obviate the action of the environment on the growing plant when in the soil, to bring about the setting of the seed. It is an acceleration of reproduction and a consequent shortening of the life cycle. The seed is first germinated to a minimum degree, and then the growth is stopped artificially and the seedlings are exposed to the necessary environment, which of course varies with each particular variety. The treated seeds must be regarded as partially developed plants, although they have the appearance of slightly sprouted grain. Sowing may be postponed until conditions are suitable, and the crop will not require the normal time for development after sowing in the field.

Some examples will illustrate the practical application of the process of vernalization. In some of the dry Steppe areas of Russia the limiting factor to the successful cultivation of spring wheat is the occurrence of high temperatures at the time the wheat is coming into ear. There are local early varieties which are grown with some success, but by using improved varieties which have been vernalized the yields have been increased considerably. One variety when vernalized came into ear 26 days earlier. This shortening of the life cycle made it nine days earlier than the standard local variety, and enabled it to outyield the standard by 11·7 per cent.

Many varieties should be tested for every locality, as the exact response to vernalization can only be found by trial. Every variety will probably react characteristically to the treatment from the point of view of acceleration of earing and subsequent yield. As the term implies, vernalization is strictly speaking a process for making possible the sowing of winter varieties in the spring; it is a short cut to the production of early maturing varieties. As such it must be looked upon as a complement to plant breeding, or at any rate as an efficient substitute for the production of early maturing varieties by hybridization.

The actual process of vernalization of long-day plants is only described in the Russian work for the hard wheat species (*Triticum durum*), and only for growth under the conditions of the Ukraine where the summer days are long. Winter wheat, when sown in the spring in the Ukraine, fails to ear because it is not exposed to sufficiently low temperatures. The days are seemingly long enough. The seed is first soaked in water until it has absorbed 45–50 per cent. of its dry weight. Temperature regulation is the important thing in the process, and while soaking, the room temperature should be 10–12°C. After sufficient absorption of water the seed is spread out in thin layers (20–25 cm.) on the floor, at a temperature not exceeding 15°C. After about 24 hours the roots will be seen to be growing, and when they begin to pierce the skin the temperature is reduced to about 3°C.; it should not be lower than 0°C., nor higher than 5°C. Spring wheat is vernalized for 12–15 days from the reduction in temperature, and the grain is stirred daily. After the 15 days it is ready for sowing. If it is not sown immediately it should at once be dried to stop further growth, but care must be taken not to kill the embryos.

In the case of tropical and sub-tropical plants, short days are necessary for the reproductive phase. To accelerate reproduction, therefore, the seed is exposed to suitable conditions of humidity, temperature, aeration, and darkness, after germination. Such vernalized seed will produce flowers and fruit even when grown under conditions of continuous illumination. In fact any type of illumination will suffice which is suitable for the normal growth of the plant.

The temperature for vernalization of these tropical and sub-tropical seeds is necessarily higher than for temperate seed, 20–25°C. being the most suitable for such plants as millet, maize, and soya beans.

Potatoes are a special case. Here we have a long-day plant being grown for a part of the vegetative body. Flowering is therefore not necessary from the agricultural point of view. On the other hand it is well known that long days favour tuber development, but it is only after the formation of flowers that the best tuber development is obtained, so that long days are most suitable for vegetative and reproductive growth. Potatoes are therefore vernalized by keeping in continuous light for 20–30 days before planting. The sprouts do not become long because of the light and dryness. Electric light is used to supplement the daylight.

Vernalization has infinite possibilities and world-wide application. Agriculture in every country has problems connected with crop raising which could be attacked from this angle. In northern Canada, for example, the limiting factor to pushing the cereal growing belt further northward has long been the lack of early ripening varieties which only require to be in the soil for a short time. The introduction of the 60-Day oat, which is a very early ripener, was responsible for bringing under cultivation large areas in the far north. But even in the prairie provinces of Canada the growing season for wheat is often too short and the crop suffers accordingly. The same is true of oat growing in Scotland, where the crop stands in the field very late and autumn frosts are always a danger, or else heavy rain which prevents harvest operations. In many of the oat growing areas of this country a wet growing season unduly prolongs the growing season, and the crop has to be cut in the under-ripe condition.

Plant breeding in oats has lately been devoted to the production of winter hardy varieties. There are two reasons for this. First, autumn sowing helps to combat the Frit Fly because the plants are in a more forward condition ; and second, autumn sowing means more prolific tillering. Vernalization would at least help in the first object, but spring sowing is bound to mean a reduction in tillering even though a vernalized autumn sown variety is used.

In horticultural crops it is possible that vernalization would help materially in the growing of early seasonal crops such as potatoes and peas. In fact, vernalization coupled with controlled growing conditions under glass, should make it possible for the grower to supply fresh vegetables and fruit to the consumer all the year round.

IV.—CEREAL DISEASES.

Varietal Resistance and Physiologic Forms of Rusts and Smuts.

Reference has been made in a previous publication of this review (Ref. 19) to the importance of physiologic strains in Wheat Stem Rust. Here we have a disease which is not caused by a single fungal unit, but by an aggregate of forms known as physiologic strains which may be compared to pure lines of an agricultural crop. During the last few years research work on physiologic strains has served to show the increasing complexity of the relationship between host and parasite in plant diseases. Newton and Johnson (Ref. 20) in Canada have found 43 physiologic forms of Wheat Stem Rust (*Puccinia graminis tritici*) and the total number of forms reported from all parts of the world exceeds a hundred. In Canada they found that the total stem rust infection in any year is generally due to the activities of only a small proportion of these forms. Thus, one physiologic form may be responsible for over 60 per cent. of the infection, the remaining 40 per cent. being contributed by perhaps four or five more forms. Further, from year to year the physiologic forms causing the great part of the infection are not the same, though one form may be most abundant over a period of years.

Johnson (Ref. 21) has shown that temperature produces marked changes in the reaction of wheat varieties to certain physiologic strains of rust, but this is by no means the whole story of the factors governing the incidence of any particular physiologic strain in any one year. In Canada Newton and Johnson think that the physiologic forms are affected in their distribution and prevalence by climate; proximity of the wheat areas to barberry bushes; length of summer spore stage of the different physiologic forms; suitability of the wheat varieties grown for spreading the forms; and the general contour of the land.

The spores that cause infection of the wheat plant are wind borne. In Canada surveys have been made of the physiologic forms, and it has been shown that natural geographic barriers such as the Rocky Mountains serve as barriers for the migration of the rust spores. It has also been found that spores occur in the air before the attack appears in the field, and then spread across the country in the direction of the prevailing wind—north-west. The initial and central infection occurs in southern Manitoba and southern Saskatchewan, and a greater number of new physiologic forms occurs in this area than in any of the subsequently infected localities. The reason for this is not clear, but the writers suggest that the new forms originated in the U.S.A. and were blown northwards.

The symptoms manifested on the wheat plant by certain physiologic forms of rust are modified by environmental conditions such as temperature, light intensity and, to a lesser extent, the carbon dioxide concentration of the atmosphere. This means that the identification of physiologic forms must be done under controlled conditions. Because sufficient attention has not been paid to this in the past, a great deal of confusion in the number of physiologic forms in existence has ensued. New forms have probably been described which were merely environmental fluctuations of forms already described and known.

There appears little doubt that new physiologic forms arise by mutation and hybridization. The theory that a physiologic form can acquire the power to attack a variety which had hitherto been immune to it is not considered favourably at the present time. As long as a physiological form remains in the summer spore stage its pathogenicity does not change, except very rarely. When, however, the fungus is allowed to complete its life history by infecting barberry, pathogenic stability no longer holds. Apparently the majority of physiologic forms do not breed true for pathogenicity, but segregation takes place only during the germination of the winter spores, which infect the barberry and give rise to new physiologic forms differing in pathogenicity. Only two physiologic forms have been found which breed true for pathogenicity.

It has been known for some years that the response of some wheat varieties to physiologic forms of stem rust is not the same in the seedling stage as in the mature plant. As the plant approaches maturity it becomes progressively more resistant until at maturity it is resistant to all physiologic strains (Ref. 22, 23). This is not true of all varieties, however, for Goulden, Newton, and Brown (Ref. 24), divided varieties into three groups according to their rust reaction at different stages of growth. In addition to those varieties which show mature plant resistance, there are some which show none at all, and others which show no appreciable difference between resistance in the seedling stage, and resistance of the mature plant. Seedling resistance is largely physiological, while mature plant resistance is generally morphological.

Many of the considerations dealt with above for wheat stem rust are also true for oat stem rust (*Puccinia graminis avenae*). In Canada nine physiologic strains have been isolated (Ref. 26) and over a period of five years three strains were responsible for 96·5 per cent. of the infection. The other forms were found to be more virulent, but were only rarely isolated in culture. Again, as in wheat stem rust, the reaction of certain physiologic forms of oat stem rust fluctuates with environment. An important difference between the two rusts, however, is that in oat stem rust the inheritance of mature plant reactions in the field is controlled by the same factors as the reaction of seedlings in the greenhouse.

One of the most important cereal diseases of this country is Covered Smut, or Bunt, of wheat. A general reference to this disease was made in the 1930 publication of this review (Ref. 19). Since then Dillon Weston (Ref. 27) has published the result of investigations in this country spread over several years. One of the first things he found was that the fungus causing this disease (*Tilletia caries*) " was not one individual, but a population of individuals." Apparently there are a number of forms similar to physiologic forms which vary in their pathogenicity.

Little Joss wheat was artificially infected with bunt spores, and the degree of infection obtained was directly correlated with the heaviness of the spore dose given. This is important because experiments on the resistance or susceptibility of different wheat varieties must ensure that every variety has an identical spore infection. Further, with all the common English varieties there was less infection in the crop when it was sown in the spring than when sown in autumn, though wheats which did not react in this way were also found. These were as heavily infected in the spring as in the autumn. So-called resistant varieties developed no bunt when spring sown and contaminated with spores from other varieties, but when dusted with their own spores they showed much less resistance. This would suggest an adaptation of particular strains of the disease to particular varieties of wheat.

Among the field factors found to affect the degree of infection, rate of seeding was the most important. The results point to the conclusion that the thinner the seeding the less the percentage infection. Surface sowing and drilling, and subsoiling and non-subsoiling gave no significant difference in degree of infection. The possibility of infection from the soil is, in Weston's opinion, very slight in this country, and need not be taken into account when testing varieties for resistance.

Testing varieties for resistance to bunt under different environmental conditions showed that a variety may be resistant in one country and susceptible in another. Thus, the variety Martin was highly resistant in this country but was highly infected when grown in Denmark. On the other hand, some varieties retained their resistance when grown alike in this country and in the U.S.A. The explanation of this loss of resistance in Denmark appears to be the occurrence of different physiologic strains of smut in that country.

When resistant varieties were contaminated with their own smut spores, and spores obtained from other varieties, it was found that they did not show equal resistance to all strains. Every variety showed susceptibility to one form or another, and particularly to their own spores. This susceptibility on the part of any variety to its own smut spores is explained by Weston as being possibly due to the fact that a process of selection goes on with repeated passage of the pathogen through the plant. This results in the elimination of strains that cannot thrive in the host plant, so that the successfully surviving strain is the one to which the plant is susceptible. Weston's work on wheat smut is a confirmation of work done in America on this subject, and brings this disease into line with wheat stem rust on the fundamental points of individualistic reaction of physiologic strains.

Grey Spot Disease of Oats.

A disease of oats which has demanded increasing attention from breeders and pathologists in late years is " Grey Spot " or " Grey Speck ". The symptoms first appear when the plants are four to eight inches high, the leaves becoming spotted with light green patches. As the season advances these patches become larger and take on a buff colour which later changes to brown. (For full bibliography on this disease see Ref. 28.) The affected areas may grow together until long brown streaks are formed between the leaf veins and the diseased leaves soon die when this stage is reached. The disease occurs in many oat-growing areas in this country and appears to be identical with the disease described as " hooghalensche " in Holland, and " Dorrfleckenkeit " in Germany.

So far no one has succeeded in isolating the organism to which it is due. Under extreme cases the plants may lose practically all their leaves, but the severity of attack is largely dependent on soil and climatic conditions. If conditions for growth are unfavourable in the early stages the damage may be very severe, but in good seasons the plants grow away from the disease, although the yield is generally reduced. The symptoms appear to be definitely associated with abnormal soil conditions, as excess of lime or alkaline fertilizers brings about the most serious attacks. The addition of acid fertilizers, such as manganese sulphate, ammonium sulphate, and sodium sulphate, are effective in keeping the disease in abeyance. In fact, manganese sulphate is wholly successful in reducing the symptoms to a negligible quantity. In Australia research work with pot cultures have shown fairly conclusively that a deficiency of available manganese in the soil is largely responsible for grey spot in oats.

Investigations in Wales and on the Continent have shown that varieties differ in their resistance to grey spot. Scotch Potato and Pearl are very resistant : Victory and Radnorshire Sprig are moderately resistant : Victory, Record, Golden Rain and Black Tartar are moderately susceptible ; while Orion is very susceptible.

Davies and Jones (Ref. 28) found that treating the soil with a solution of manganese sulphate (corresponding to a dressing of 3–4 cwt. per acre) not only kept the disease completely in check, but also resulted in larger and more luxuriant growth and a final increase in yield over plants grown in untreated soil. Further, the grain-to-straw ratio was higher in the treated plots, and the grain was larger and had a lower percentage of husk. The disease therefore appears to inhibit satisfactory filling of the kernel, and therefore reduces the quality as well as the yield of the crop.

There appears to be no difficulty in breeding for resistance, as Akerman has shown that there is clear-cut segregation into resistant and susceptible forms on crossing a susceptible with a resistant variety. Resistance in his crosses was dominant to susceptibility, and he was able to extract lines that were more resistant than the resistant parent, and more susceptible than the susceptible parent. This is an example of what is known as "transgressive segregation", a not uncommon phenomenon in breeding investigations.

In conclusion, it should be noticed that grey spot differs from the rusts and smuts and other common diseases of cereals. In these latter diseases there is a definite organism which attacks the plant and causes morbid changes in the tissues. The organism lives parasitically on the host and upsets its normal functions, or kills isolated local patches of the host tissue. The smuts and bunts destroy the whole developing kernel and replace it by fungal spores. Grey spot, on the other hand, appears to be a "physiological disease". No organism inducing it has as yet been isolated, and seed transmission certainly does not occur. This is true also in some other diseases, such as Virus diseases, but with Viruses it is definitely possible to infect healthy plants from diseased ones. At the time of writing there is no evidence that this is possible in grey spot, and the fact that the disease can be completely checked by adding a chemical salt to the soil suggests that a physiological disturbance in the plant's metabolism is the direct cause.

The Effect of Light on Some Pathogenic Fungi.

Everyone knows that it is possible to split up white light into a number of colours. This spectrum contains the colours red, orange, yellow, green, blue, indigo, and violet, and each has a separate wave length. All the colours coming within this range of wave length are visible to the human eye. There are, however, vibrations which fall outside this range and constitute what is known as "invisible light". Ultra-violet light is the best known example of this, and it is well-known that this light is most potent in affecting living organisms. Small amounts of ultra-violet are often beneficial: large doses are invariably harmful.

Recent work by Dillon Weston (Ref. 29, 30) has shown that various fungi, pathogenic and non-pathogenic, are profoundly affected by both visible and invisible light. First let us take the effect of ultra-violet light. Working with physiologic strains of wheat rust, Weston found that the pigment in the walls of the summer spores exerts a protective function on the spore vitality by preventing the penetration of ultra-violet light. White and orange coloured spores selected from certain physiologic strains were more susceptible to ultra-violet light than were red or grey ones. The growth of various miscellaneous fungi was also found to be retarded when exposed to ultra-violet light, though subsequent spore formation was much greater in the irradiated cultures. It would seem therefore that there is here a case somewhat analogous to the photoperiodic phenomena described previously, only that reproduction of these fungi was encouraged by wave length, and not length of exposure, of the light. Although artificial ultra-violet light can kill spores, ordinary sunlight is not, as a general rule, sufficiently strong. When spores are killed by sunlight it is the heat waves that exert the lethal action.

Subsequent experiments have shown that summer spores of *Puccinia graminis tritici* (rust) are almost incapable of germination in sunlight. Spores kept in dishes that were covered with vita glass or ordinary glass germinated badly, while the spores did not germinate at all when left uncovered. The fact that very little germination takes place under ordinary glass which cuts out the ultra-violet light indicates that it is not the ultra-violet light which is inhibiting, but merely the visible white light rays. Neither do temperature and humidity factors appear to affect this inhibitory power of sunlight.

Now, as stated above, white light is composed of lights of different colour. When the rust spores of these particular physiologic strains were exposed to different coloured lights it was found that they germinated in blue and yellow light as satisfactorily as in the dark, but red, orange and yellow light inhibited the germination. The same results are found with oat stem rust and oat crown rust.

The significance of this work lies in the relation of spore germination and the factors affecting it in the field. Rust spores always germinate on the under surface of the leaves and fungal growth takes place within the leaf tissue. The green colouring matter of the leaf—the chlorophyll—absorbs the red, orange, and yellow colours almost entirely, and it is this light that inhibits spore germination and growth. The spores are therefore exposed, as also is the fungal mycelium developing from it, to the light colours which are most conducive to their growth. The light absorbed by the leaves is somewhat modified by the concentration of the green colouring matter, and Weston found that different shades of green also affect the germination of rust spores. It is possible that the differential response of wheat varieties to physiologic strains of rust is to be partially explained by differences in the chlorophyll content of the leaves. This would lead to different shades of colour penetrating to the fungal mycelium and affecting its growth. The whole subject is still very much in the experimental stage, however, and more work is required before any definite conclusions can be reached.

The Nature of Disease Resistance.

There are three types of disease resistance in plants—physiological, morphological, and functional. Physiological resistance is due to some incompatibility existing between the plant and the disease-causing organism, for a pathogenic fungus may penetrate the tissues of a physiologically resistant plant, but is then quite unable to make any headway and soon dies. A variety may of course be physiologically resistant to some physiologic forms of wheat stem rust, oat stem rust, and wheat bunt, and completely susceptible to others. In wheat stem rust physiological resistance means that a variety is resistant at all stages in its growth and development.

Morphological resistance is dependent on some structural attribute of the plant by which it inhibits the extensive internal development of the fungus even if it does succeed in penetrating the epidermis. The fungus of wheat stem rust, for example, may enter the wheat plant and can grow unobstructed in the soft tissues of the culm. But where there is a great development of hard strengthening tissue (*sclerenchyma*), then the fungus is restricted in its growth and the variety is to all practical purposes partially resistant.

The third type of resistance, which is described as functional, is due to some functional behaviour on the part of the plant. Thus, Hart (Ref. 31) has shown that the opening and closing of the stomata of wheat varieties can determine resistance or susceptibility to stem rust. The stomata are openings or pores in the epidermis of all green parts of the plant. They are very minute and occur in great numbers on the leaves and green parts of the straw. The function of stomata cannot be entered into here, but they serve as the means of gaseous exchange between the plant and the atmosphere for the vital processes of photosynthesis and respiration. In addition, a great deal of water passes out through the stomata from the plant, and may cause wilting if sufficient water is not being absorbed by the roots to take its place. Finally, stomata are sensitive to environmental conditions and open or close as conditions of relative humidity and light alter. As a general rule, it may be said that stomata are closed at night and open in the early morning when the sunlight becomes sufficiently strong. They remain fully open during the forenoon under normal conditions, and gradually close through the afternoon.

Infection of wheat plants by rust can only take place through the stomata. When a rust spore germinates the germ tube can only find entry into the plant through the open stomata. It is thus of great importance to study stomatal behaviour in relation to rust infection. Hart found that the greatest infection took place in the early morning when the stomata were opening and the leaves were bathed in dew. If the stomata open quickly in response to sunlight, then the spores which have germinated in the moisture on the leaves will quickly penetrate into the plant. If, on the other hand, the stomata are tardy in opening, the moisture on the leaves will dry off in the sunlight and the germinating spores will die before the stomata open.

Hart found that stomatal behaviour was not identical in all wheat varieties. In some varieties the stomata open quickly after sunrise and remain open most of the day. In others the stomata open slowly and remain open for a short period. The former type show marked susceptibility to stem rust, while the latter are resistant. Hart is of the opinion that "general field resistance" of varieties to rust is a reflection of their stomatal behaviour. Varieties which show this type of functional resistance are often readily infected with rust artificially, so that inoculation experiments on rust resistance may be quite misleading.

In a more recent paper, Hart (Ref. 32) has dealt fully with all the factors affecting rust resistance in wheat and she concludes that any variety of wheat may possess morphological, physiological, or functional resistance, or any combination of the three. Functional and physiological resistance are attributes of the plant from the seedling to the mature plant. Morphological resistance, on the other hand, changes with the plant's development as it is dependent primarily on the "percentage and distribution of rust-susceptible tissue". In the seedling stage practically all the tissue is susceptible, but as the plant matures the amount of hard strengthening tissue increases and the plant becomes correspondingly resistant. Different parts of the plant offer different amounts of rust-susceptible tissue, the leaves having the most and the culm and rachis have the least. Occasionally a variety may be resistant by reason of the inability of the fungus to burst the epidermis and produce pustules.

In conclusion, it should be pointed out that Petersen (Ref. 33) has further examined the question of functional stomatal resistance in relation to the breeding of resistant varieties. He does not agree with Hart in the importance she attaches to the behaviour of stomata in relation to resistance, though he agrees that this behaviour may have a slight effect. Petersen is of the opinion that the small differences in the time of stomatal opening in the early morning are not sufficient to account for the great difference in susceptibility to rust. He further refers to the case of two varieties which have the same stomatal behaviour, but different types of rust reaction in the field and uses this as an argument against Hart's contentions. The validity of this does not seem sound, however, as, though the stomatal behaviour may be the same, one of these varieties may have a morphological or physiological resistance that the other does not possess. Petersen also found, however, that keeping the plants moist by spraying did not increase the rust infection as would be expected if Hart's theories of stomatal infection were true.

Breeding for Disease Resistance to Rusts and Smuts.

Considerable advance has been made in late years in the breeding of disease-resistant varieties of wheat and oats. In wheat, particularly, resistance to stem rust has been handled with increasing success by plant breeders. This is largely due to two things. First, it has been possible to transfer the resistance of the hard wheats and emmer wheat to varieties of the bread wheats, so combining baking quality and rust resistance in the one form. Secondly, the discovery of the independent inheritance of mature plant resistance and seedling resistance has simplified matters considerably. Instead of trying to combine in one variety seedling resistance to many physiologic strains based on greenhouse inoculations, attention has been focused on mature plant resistance based on field observations (Ref. 25). Mature plant resistance is almost equally effective with all known physiologic forms of wheat stem rust, so that the breeding of resistant varieties is dependent on the inheritance of one character which may be controlled by one or more genetic factors (Ref. 34). The mode of inheritance or resistance of wheat stem rust varies in different crosses, but segregation has so far been found on more or less straightforward Mendelian lines.

Breeding rust-resistant oat varieties has not progressed so far. Breeders are still endeavouring to combine resistance to all the physiologic forms in one variety, but as yet it has not been possible to find a variety resistant to one particular form (Ref. 35). Fortunately, this one form is not common, and as it has been possible to combine resistance to the other forms in certain varieties breeders may feel reasonably happy.

Resistance to oat stem rust is inherited on simple Mendelian lines according to the results of the majority of workers. One factor governs the inheritance, and resistance is dominant to susceptibility (Ref. 35). Welsh has worked out the resistance to particular physiologic forms and has found that five separate forms are governed by a single factor inheritance, while four of these are controlled by the same factor.

In loose and covered smuts of oats it is more difficult to work out the mode of inheritance as "smut reaction is not completely expressed in the progeny" (Ref. 35). Opinion varies as to whether resistance is governed by one or two factors, but transgressive segregation was found to take place in some crosses. This means that in crossing a resistant and a susceptible variety, some forms were extracted in subsequent generations which were more susceptible than the susceptible parent, and others which were more resistant than the resistant parents.

V.—LODGING IN CEREALS.

In countries where more or less intensive agriculture is practised the factor which limits increasing yields of cereals is the standing ability of the straw. Everyone is familiar with the sight of "laid" crops due to the land being too rich. The cereal plant becomes incapable of supporting the excessive growth which takes place, and round about earing time the plants heel over at the base and lie flat on the ground. This lodging of cereal crops may have disastrous effects on the monetary returns. Not only does it make harvesting operations more expensive, but it may also ruin the quality of the grain. If the weather is wet at harvest time the ears lying on the ground may remain sodden for days on end. In barley this is disastrous to good malting samples, as the grain becomes discoloured and fails in the initial stages of maturing. Many white wheats are particularly liable to sprout, and the continued wet state of the grain encourages this.

It is thus of great importance to cereal growers in countries like England to grow varieties which have good standing capacity. Given the assurance that the crop would not become laid, most farmers could economically increase their yield by at least 20 per cent. Most of our common cereal varieties will stand up to the average conditions of this country, but if the general level of yield is to be raised, or if farmers wish to produce bumper crops of 70–80 bushels, then it is necessary to produce varieties with higher standing capacity. But the first step is to inquire into the factors which govern this ability of the plant to stand up under intensive treatment.

Factors Affecting Standing Capacity.

It has always been assumed that lodging is due to a defect in the strength of the straw. If wheat varieties are examined it will be found that straw characters vary a great deal (Ref. 36). There are short, thick, rigid straws, and long, slender, whippy types. In English varieties the large-diameter, upright type of straw is the most in favour, as is seen by the most popular varieties such as Square Head's Master, Browick, and Yeoman. The Rivet wheats are the only slender, whippy strawed varieties grown in this country. In rough weather these two types behave quite differently, for whereas the rigid type does not give much in a wind, the whippy type sways about, and as the ears ripen they lie over in the direction of the wind. Both types have their disadvantages, for in a strong gale the rigid type is apt to become laid merely because it is too rigid, and the whippy type is apt to bend over too much so that the ears and straws become entangled and do not regain their upright position. Heavy rain is then liable to beat down the crop.

Lodging is most likely to occur when the grain is filling out, at the end of June or beginning of July, or later, according to the locality. When the crop becomes laid at this stage the straw is still capable of growth and the ears may be brought to the erect position again by unequal growth of the upper nodes of the straw. If the crop goes down later, the straw has finished growth and it is incapable of lifting the ears from the ground.

Now what is the cause of the straw becoming laid? There must be some physical weakness which manifests itself under a purely mechanical strain. It is usually thought that strength of straw is the limiting factor to standing capacity, but in short, stout strawed varieties, lodging is due to the weakening of the adventitious root system at the base of the stem. These roots spread out in all directions from the lowest nodes of the culms and the tillers are supported in lateral stresses and strains by these roots. If the straw is being forced from side to side by strong winds, then these roots may be loosened in the soil, or even broken, with the consequent collapse of the culm. This is most liable to happen when the surface soil becomes very wet in heavy rain and the adventitious roots are loosened. A short stiff straw is not liable to so much lateral movement as a long less rigid one, so that strength and length of straw *is* important in considering lodging.

Standing capacity is thus dependent on two attributes of the plant—strength of straw and adequacy of root system.

One without the other is not sufficient. Strong straw with weak root development means collapse of the roots when the straw sways in strong winds. Weak straw may buckle under the strain of heavy rain or hailstorms. Little has been done to improve the root system of cereals, in fact very little is known about root development. The study of the factors controlling standing capacity has mostly been limited to the straw.

Zade (Ref. 37) came to the conclusion that resistance to lodging is largely determined by length and resistance to bending of the straw, coupled with the amount of foliage borne on the culms. Zavada (Ref. 38) and Draghetti (Ref. 39) both think that elasticity of the straw is of primary importance. For many years attempts have been made to discover what exactly controls the strength of the straw. Chemical analyses of weak and strong strawed varieties have been made, and several workers have concluded that weakness of straw is caused by a deficiency in the silica content. Welton (Ref. 40) found that a low percentage of dry matter in the straw caused lodging in oats and wheat. The low dry matter he found to be due to low carbohydrate content, particularly lignin and reserve foods. The results of work by Tubbs (Ref. 41) lead to the conclusion that "nitrogen and phosphorus deficiency increases the strength of the lower internodes of the straw, while potassium starvation decreases the strength of the lower, and increases that of the middle internodes. The effects of manurial deficiency are most marked in the lower internodes, the upper ones approximating to the normal."

Davidson and Phillips' (Ref. 42) findings confirm earlier workers in that their experiments show that the silica and ash content of lodged straw was lower than in straw that was not lodged. They also found that sodium nitrate depressed the silica and ash content and thus appeared to be responsible for the lodging. Their most surprising result was in connexion with the lignin content of the straw. Lignin is an important constituent of the cell walls of strengthening tissue, and it has long been thought that the amount of lignin in straw should be a guide to its strength. Davidson and Phillips found that the lignin content from the fertilized lodged straw "was distinctly higher in every case than of that from the control plot". They are therefore tempted to conclude that a high lignin content is the cause of lodging. This agrees with work by Dadswell and Hawley (Ref. 43), who found that in Douglas fir the tougher wood had a lower lignin content. High lignin would appear to make for brittleness and not for elasticity.

Breeding for Resistance to Lodging.

Until the factors underlying strength in straw are elucidated little can be done in the selection of varieties of good standing ability except by mere eye judgement. In this country a great deal has been done to improve the quality of the straw of our cereal varieties by breeding. Strength of straw is definitely heritable and selection of improved lines with the desired straw qualities has resulted in stronger strawed varieties of wheat, barley and oats which are capable of standing up to higher yields than the older varieties. At Cambridge this has been one of the main considerations in all the cereal breeding work. Crosses have been made between strong-strawed varieties, and those with other desirable qualities such as high yield, disease resistance and quality. The range of straw types which appears in the second generation in such crosses with wheat is truly amazing. Rivet wheat has been used a great deal as the strong-strawed parent, and many desirable straw types have been selected from Rivet crosses which are used solely for breeding purposes. New strains are only selected if they show good standing capacity, and they are given definite tests by sowing with wide spacing between the drills so that the plants do not give each other much support. This treatment is sufficient to make most English varieties lodge, so that any strains which can withstand this test are definitely worthy of further trials on yielding capacity, disease resistance, and quality (Ref. 36).

Recent work in oat breeding has been directed towards improvement of the standing capacity by improving the straw. In Ireland the lodging of oats has been a serious consideration because the rainfall and temperature are higher during the growing season, and this leads to excessive growth. From a cross between Banner and Black Tartary a new variety, Glasnevin Sonas, was derived which is superior in standing power and yield to either of the parents. Again, using Black Potato and Victory as parents, a new variety, Storment Arrow, was selected which combined the good straw of Black Potato with the high yielding abilities of Victory (Ref. 44).

In barley breeding, work has likewise been directed towards the improvement of standing capacity, and its association in one variety with the important character of malting quality. No recent work has been done in this country on this problem, and the story of the introduction of Plumage-Archer and Spratt-Archer is now an old one. On the Continent three new strong-strawed barley varieties have been produced, all of which are now being grown at Cambridge with a view to their possible use in hybridization. One at least, which is a two-row form and shows definite winter-hardy propensities, has distinct possibilities as a parent for crossing with our good malting quality varieties.

VI.—QUALITY AND ENDOSPERM CHARACTERS IN WHEAT.

"*Strength.*"

Quality or "Strength" in wheat is the capacity of the flour to produce a large, well-shaped loaf of good texture. It is well known that with the exception of Yeoman all English wheats are of poor quality for baking and have to be blended with "strong" imported wheats which come largely from Canada, U.S.A. and Australia. Strength is intimately bound up with the quality and quantity of gluten present in the flour. The ability of dough to rise is dependent on the production of sufficient carbon dioxide within its substance, and the power of the dough to trap this carbon dioxide as it is formed, so causing the dough to be puffed up. The gluten is also important in that it is mainly responsible for the water absorption of the flour and determines to a large extent the number of loaves that can be made from a given amount of flour. Another important factor governing the quality of flour is its diastatic activity which governs the rate at which sugar is produced from the starch for alcoholic fermentation and the production of carbon dioxide by the yeast. At the present moment the only satisfactory test of quality is baking. Physical and chemical tests are not infallible and are often misleading merely because the physics and chemistry of strength are not well understood.

Wheats of good quality are generally translucent, flinty, and hard, and have a high protein content. The converse is not true, however, as a wheat may have the above endosperm characters and yet not be strong. Weak wheats are generally soft, starchy, and opaque, but a weak wheat may often be made flinty looking by too much nitrogenous manuring. In some cases the endosperm may be flinty in one part and mealy in another. Growing conditions can affect the appearance of the endosperm to a great extent. The so-called "bread wheats" (*Triticum vulgare*) include varieties which are excessively opaque and starchy and which are used for biscuit manufacture, and the strong wheats of North America which are of the finest quality.

Red Fife wheat is universally recognized as the finest quality wheat in the world, and its blood has been used in the breeding of practically all the strong wheats grown in the world at the present. Wheats of the Fife type retain their strength when grown under any conditions, but there are other wheats which depend on the environment for the production of good quality flour. Thus some continental wheats which are strong when grown in their native countries rapidly lose their strength when grown in England. This is of vital importance, because it is obviously no use breeding from this latter type in the hope of obtaining inheritance of strength when it is dependent on environmental factors for its manifestation.

Factors Affecting Endosperm Characters.

Although it is inherent in any variety to produce a definite type of endosperm, yet this may be modified to a great extent by a number of external factors. The type of soil may alter the flintiness, as it was found in this country that heavy soils tend to produce flinty grains, while light sandy soils have the opposite effect. All varieties, however, are not affected in the same way by soil types. Wide spacing of the plants, according to Percival, increases the translucency of the grain, and the same author and other workers have found that harvesting in the immature state gives a more translucent sample of better quality. Wilson and Raleigh on the other hand found that milling and baking quality improved with grain maturity. Percival also found that there was a tendency for the translucency of the grain to vary with the position of the spikelet on the ear, and the position of the grain in the spikelet. Spikelets from near the middle of the ear tend to produce the more translucent grains, as do the lower florets in the spikelet.

The question of the effect of various manures on the endosperm characters has not been satisfactorily answered. Different workers using different varieties growing under dissimilar environmental conditions are not of the same opinion. Woburn experiments point to the conclusion that manuring has little effect on grain quality. At Rothamsted manuring impaired the quality. Percival, Geriske, Richardson, and Pendleton all claim that nitrogenous manuring affects the endosperm either by increasing the translucency (Percival) or else by increasing the protein content. The probability is that soil and climatic factors, and the variety used in the experiment, all affect the results, so that it is not at all certain what will be the result of manuring on the final endosperm characters under any set of conditions.

The climate during the growing season probably affects the endosperm characters more drastically than anything else. It certainly seems without doubt that the slow growing conditions and moist atmosphere of this country tend to produce soft, opaque grain. In this country, and other countries with a similar climate, the slow ripening conditions appear to encourage high yields of starchy grain. Where the final stages of development are hurried on in dry, hot climates, then the yield is low but the grain is translucent, hard, and of high protein content. Van de Sande Bakhuyzen found that dry conditions during flowering tend to produce grain with a high protein content, but which is badly filled. There is no doubt that the few days prior to flowering, and also probably the period of flowering itself, is a most important phase in the plant's growth in affecting the yield and quality in all cereals.

Raw (Ref. 45), working in Australia, recently confirms most of the facts dealt with above, and supplements it with some original findings. He used a variety called Free Gallipoli which has grain of three types—flinty and translucent: soft and opaque: and mottled, *i.e.* partly translucent and partly opaque. The object of his investigation was to isolate strains which produced only one type of grain. He started with single grain selection, sowing out 200 grains of each type, and making detailed observations from germination onwards. He found in the initial stages of growth that the translucent grains were more vigorous in germination, and continued to be more vigorous throughout their growth than the opaque or the mixed grains. "Of the plants from the translucent grains more reached maturity, and these all showed higher stooling capacity, were taller, and yielded better than those in the check rows or in the rows sown with opaque grain." The check rows contained translucent and opaque grains just like the original sample of Free Gallipoli. When the resultant grain types were examined it was found that they were either pure translucent or mottled. Pure opaque grains were entirely absent. Forty-three per cent. of the plants from translucent grain produced translucent grain: while in the opaque and check rows the percentage of translucent grain producing plants were 59 and 51 respectively. The same kind of results were obtained over a period of three years and Raw concludes that in Free Gallipoli at any rate endosperm types are "not Mendelian characters, but are determined largely if not wholly by internal and external factors of which season is perhaps the most important". He suggests that the rate of drying out of the grain during ripening is the principal factor determining the final character of the endosperm.

With regard to manuring Raw found that nitrogenous fertilizers, whether applied at seeding or later, increased the percentage of translucent grains. Superphosphate under ordinary conditions had no effect, while potassic fertilizers decreased the percentage. Spring applications of sodium nitrate affected the nitrogen percentage of the grain, but other fertilizers had no effect. In these experiments it was also found that rate of sowing per acre had no effect on the endosperm when the crop was sown early. When the crop was sown late, however, the percentage of translucent grains increased with the rate of sowing. Later seedings on the whole result in greater translucency of grain.

Finally, a positive correlation was found to exist between the weight of a thousand grains and the percentage translucency. On the other hand no correlation was found between total nitrogen content and percentage translucency. This again bears out what was stated above, that the translucency of the grain is not a guide to the baking quality. It must always be borne in mind that environmental and other conditions affect the appearance of the grain to a very material degree. There is still no short cut to the recognition of grain of good quality: the acid test is baking. Variety holds the key position in the production of a strong flour. Strength may be inherited independently of everything else, or else a variety may require a definite set of conditions to produce grain of good baking quality.

Breeding for Quality.

In breeding for quality the first essential is obviously to obtain one of the parent forms with indisputable heritable strength qualities which are independent of environment. In crossing a weak wheat with a strong wheat or *vice versa*, the first generation always has the appearance of being of good quality. In the second generation strong and weak types appear. The weak type breeds true, but the strong split up into strong and weak, or breed true for strength. It is from this latter class that selection is made to procure a new true breeding strong form. It was in this way that Biffen selected Yeoman from a cross between Red Fife and Browick. Red Fife contributed the baking quality, and Browick contributed the high yielding ability. Yeoman combines the two desirable characters in the one variety.

Recent wheat breeding work at Cambridge (Ref. 46) is being directed towards the production of varieties which can be used in baking without admixture with foreign varieties. Yeoman II (a selection from Yeoman I) has been used as one parent, and a pure line of White Fife as the other. Both parents therefore possess the desired qualities of strength. A number of promising forms were isolated in the fourth generation, which show a definite improvement on Yeoman. These are now being tested by the Natural Institute of Agricultural Botany. It is most desirable that new varieties of good baking quality and with a wide range of growing conditions should be available for the farmer. In this way the present restricted wheat-growing area may be considerably extended.

VII.—FRUIT BREEDING INVESTIGATIONS.

In an earlier publication of this review (Ref. 47) reference has been made to the question of self-sterility and incompatibility in fruit trees. By self-sterility is meant the inability of a particular variety to set fruit unless pollinated by another variety. But all varieties are not equally successful in pollinating one another, and when there is failure in this cross-pollination the varieties are said to be incompatible. Incompatibility is really another aspect of sterility.

At present three types of sterility are recognised in fruit trees (Ref. 48).

1. Generational sterility. This is due to failure either of the male or female sexual parts to develop normally. Thus the pollen, embryo sac, embryo, or endosperm may cause generational sterility.

2. Morphological sterility. Flowers sometimes develop in which the stamens and the ovaries have been suppressed or are aborted. This must necessarily cause sterility.

3. Incompatibility is due to the failure of the pollen to reach the ovary and bring about fertilization. This may happen even though the pollen is normally functional.

Much light has been thrown on these various aspects of sterility in recent years, and investigations have shown that the chromosome constitution of the plant plays a vital part. As is now well-known, every plant species normally possesses a definite number of chromosomes. These chromosomes bear the hereditary factors, and they occur in pairs in every plant cell, except the reproductive cells, where the number is reduced to half. The number of chromosomes in the reproductive cells is looked upon as being the basic number beyond which normally no reduction can take place. This number is spoken of as the "haploid" number, and when fertilization takes place two haploid numbers are brought together by the male and female nuclei, and the resulting individual is said to be "diploid" in its chromosome number.

Multiplication of the chromosomes may, however, take place, and more than two haploid sets may appear in the vegetative cells of the plant. Thus there may occur triploids, tetraploids, pentaploids, hexaploids, etc., according to whether the cells contain three, four, five, or six times the haploid chromosome number. This phenomenon of chromosome duplication is spoken of as "polyploidy", and has far-reaching effects in plant breeding. It occurs in wheat and oats and throughout the cultivated fruits. Thus plums and damsons are hexaploids; the sloe is tetraploid; the Sweet cherries are diploids; the Sour and Duke cherries are tetraploids; while apples may be diploids or triploids. This polyploid state greatly affects the questions of sterility and incompatibility, and this is of great importance in practical breeding.

Doubling of the chromosomes may arise in two ways. First, a diploid plant may produce tetraploid shoots either spontaneously or else by artificial stimulation. Such a polyploid is called an "autopolyploid". Second, hybridization of varieties or species may result in chromosome duplication. The resulting individual is then spoken of as an "allopolyploid". Whichever way the doubling takes place it may affect fertility in either of two ways. A sterile diploid may become fertile on assuming the tetraploid state, while a highly fertile diploid may show reduction of fertility. Thus polyploidy may cause a change to increasing sterility, or increasing fertility, according to the degree of fertility of the original individual.

Now the explanation of generational sterility is possible by this phenomenon of polyploidy. If a polyploid has an odd number of chromosomes in its vegetative cell which cannot be equally halved in the formation of the reproductive cells, then irregularities in chromosome distribution are bound to take place. This leads to a high degree of sterility in most cases. A good example of this is seen in the genus Rubus, where the diploid raspberry and the tetraploid veitch berry set fruit abundantly, while the triploid mahdi is not so productive. Again, in the genus Prunus, the odd multiple polyploids are so highly sterile that they cannot be used for breeding, but are useful as flowering ornamentals. Sterility is an advantage in flowering of this kind, as when no fruit is formed the trees will continue to flower abundantly year after year. Similar examples of the sterility of the odd multiple polyploids are to be found in the strawberries and the currant.

Morphological sterility due to the suppression or abortion of the reproductive organs is not so uncommon in fruit as is generally thought. In the plum variety Golden Esperen the anthers do not contain any good pollen, and therefore the variety is useless as a pollinator, though it will set fruit when pollinated with some other varieties. There are several peach varieties which are also male sterile. At Merton they have found that there are four sexually distinct forms of raspberry—hermaphrodite, male, female, and neuter. The females bear fruit when pollinated with other varieties ; the males and neuter of course never fruit.

Cherries.

Incompatibility is not identical in all its aspects in the different fruits grown in this country. Let us take the case of cherries first. Crane and Lawrence (Ref. 49) have shown that all varieties of Sweet cherries are self-incompatible, and most varieties fall into one or other of a number of groups within which all the varieties are self- and cross-incompatible. It is evident, also, that incompatibility is controlled by genetic factors, and pollen cannot function in the style of a plant which carries the same incompatibility factors (Ref. 48). The Sour and Duke cherries differ from the sweet cherries in that different degrees of self-incompatibility exist. Further, on crossing Sweets, Sours, and Dukes, varying amounts of fruit are set according to which way the cross is made. When a Sweet cherry is pollinated by a Sour or a Duke, more fruit is set than when the Sweet is used as a male parent. The explanation of this is probably to be found in the difference in chromosome number. When a Sweet cherry (diploid) is fertilized by a Sour or a Duke (both tetraploids) then the hybrid endosperm is tetraploid, which is probably better capable of normal development than is the pentaploid endosperm of the reciprocal cross.

Plums.

Plums show more complex incompatibility phenomena than do the Duke and Sour cherries (Ref. 49). Plum varieties can be divided into three groups according to their incompatibility characteristics :—

1. Self-compatible. A full fruit crop set with their own pollen.
2. Partially self-compatible. These varieties set a variable crop when self-pollinated, but the crop is never as heavy as when crossed with a compatible variety.
3. Self-incompatible. No fruit set at all when self-pollinated.

All combinations of these groups occur. There is self- and cross-compatibility, and self- and cross-incompatibility, with varying degrees of self- and cross-incompatibility. Further, reciprocal matings give different results. It is surprising that this should be so as the cultivated varieties tested all have the same number of chromosomes. There are comparatively few cases of cross-incompatibility, most varieties being either self-compatible, or self-incompatible. The only examples of cross-incompatibility are :—

Group I.	*Group II.*	*Group III.*
Coe's Golden Drop.	President.	River's Early Prolific.
Coe's Violet.	Late Orange.	Blue Rock.
Crimson Drop.	Cambridge Gage.	
Jefferson.		
Allgrove's Superb.		

" All the varieties in Group I, and the varieties President and Late Orange in Group II, are wholly self- and cross-incompatible within their respective groups. Cambridge Gage sets occasional fruit when selfed or crossed with a co-incompatible. When used as a male, however, it sets a full crop on the other two varieties. Similar differences occur in Group III " (Crane and Lawrence).

The complexity of the compatibility relationship in the plums is probably due to their high chromosome number (Ref. 50). They are hexaploids and the number of incompatibility characters being carried by any variety is thus three times that of the diploid Sweet cherries. There appears no doubt that incompatibility is more complex in polyploids than in diploids. On the other hand the more complex the polyploid the less frequently will incompatibility occur. This is due to the fact that polyploids carrying the same incompatibility factors are less likely to meet the greater the number of factors being carried, *i.e.*, the greater the polyploidy.

Apples.

Apple varieties are either diploid (34 chromosomes) or triploid (51 chromosomes). This is not the full story of chromosome peculiarity in apples, though, as even the diploids have a peculiar constitution. As Crane says, " The gametic number of chromosomes is seventeen, but this number is the result of reduplication of an original set of seven in different proportions, being tetraploid in respect of four chromosomes and hexaploid in respect of three." This characteristic chromosome constitution is undoubtedly responsible for the peculiarities in breeding behaviour.

Sterility and incompatibility differs in apples from that in plums and cherries in three respects (Ref. 51).

1. Incompatibility is continuous and manifests itself in a varying degree in apples. Absolute incompatibility rarely, if ever, occurs.

2. Generational sterility is as a general rule higher in apples than in plums or cherries.

3. Few seeds, and weak seedlings, is often the result of hybridization.

It seems that the low percentage of fruits set in self-pollination is due to self-incompatibility because a much higher percentage results from crossing with suitable varieties. It is difficult to measure the degree of self- and cross-incompatibility in apples because pollination is often sufficient to stimulate fruit development. Fertilization of the ovule may take place, and the seeds may develop to a degree and then shrivel up. This does not affect the fruit development, though most varieties probably require the first stages of fertilization as a stimulant to fruit production. The only true measure of incompatibility in apples is therefore the number of good seeds set. Crossing experiments have shown that crossing diploid varieties sometimes gives better seed setting than selfing, and sometimes not. Triploids crossed with diploids give poor seed development, and triploid selfs are generally sterile and unfruitful.

It is only possible for the relatively sterile triploids to be grown economically because in apples only a very small proportion of the flowers need set fruit to give a satisfactory yield. Also, only the initial stages of fertilization are necessary to stimulate fruit development, and good fruits may result even though the seeds fail to develop. Apples are therefore less dependent on fertility than other fruits. In fact, some varieties can produce fruit without fertilization and without seeds. Triploid varieties produce only 4–27 per cent. good pollen, while diploids produce 50–97 per cent. Thus one would expect diploid varieties to be better pollenizers in the field than triploids, if incompatibility is not taken into consideration. But from Crane and Lawrence's work (Ref. 51) fruit development (not seed development) was somewhat better in triploid combinations than in diploid crosses, and they explain this as being probably due to the fact that with triploids there is a greater chance of compatibility. It is important to recognize here the difference between fertility as shown by seed formation and fruitfulness as shown by the number of fruits set.

Summing up the whole position of compatibility in relation to chromosome number in the fruit trees, one may say that increase of chromosome complexity means greater variation in degree of compatibility or incompatibility. The diploid cherries show the clear-cut cases of self-incompatibility and cross-incompatibility. In the tetraploid cherries degrees of self-incompatibility occur, while the hexaploid plums show complete self- and cross-compatibility, complete self- and cross-incompatibility, and degrees of self- and cross-incompatibility.

Degrees of incompatibility occur in the so-called diploid varieties of apples, but it was explained previously that there are no true simple diploids in the apples. Duplication of the chromosomes has brought about a peculiar position of "secondary diploidy", which is in effect polyploidy. It is therefore safe to say that in the fruit trees degrees of incompatibility only occur in association with polyploidy.

Examples of the importance of chromosome number in relation to fertility and fruitfulness could be added to the examples given above, *e.g.* in the genera *Fragaria* (strawberries); *Rubus* (raspberries, blackberries, etc.); and *Ribes* (currants). The phenomena concerned are of vital importance to the breeder and grower and no one connected with fruit growing can afford to neglect the findings of this research.

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DAIRY FARMING AND DAIRY WORK.

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I.—Dairy Herd Management.

The problems which arise in the management of a dairy herd are many. They vary in importance according to the condition of the herd with regard to health, maintenance and milk yield and the position of the herd owner in relation to the marketing of his product. The main object of this review of the research work of the proceeding year is to summarize the results in such a manner as may be helpful to the dairy farmer in overcoming the difficulties with which he is confronted and to bring new information to his knowledge to aid him in deciding his future policy and practice.

Development of Tubercle-free Herds.

In previous issues of this review (Ref. 1) attention has been drawn to the development and maintenance of tubercle-free herds and during the past year the discussions which have taken place on the prevalence of tuberculosis in dairy herds and on the desirability of pasteurization of milk for human consumption on a larger scale, have again directed attention to this subject. The diminution and ultimate eradication of bovine tuberculosis is mainly a veterinary problem but it is also of real interest to the herd owner, and it is from this point of view that reference is made here to the report which has been issued by Wye College on Milk Production over Five Years including an example in building up a Tuberculin-tested Herd (Ref. 2). The report states that up till 1922 a small herd of Shorthorns or Shorthorn crosses was kept on the College farms chiefly for teaching and demonstration purposes; in that year it was decided to increase the herd up to about 30 head and in 1927 it was decided to build up a tuberculin-tested herd and to qualify for the sale of Grade A (Tuberculin-tested) Milk under the Milk (Special Designations) Order.

The first test was made in October, 1927, when 63 animals of different ages were tested and 19 reacted (30 per cent.). Testing was continued at six-monthly intervals and in so far as the cows and in-calf heifers were concerned while 9 out of 27 reacted in October, 1927, the number of reactors in June, 1928, was 2 out of 18 tested, and in December 1928, 4 out of 23 tested. During the next three years only 2 reactors were found, and in each case the cow had been bought within the preceding twelve months as having passed the test. Two heifers which reacted in 1928 had also been bought as having passed the test, and these experiences (which have been found to occur in other herds) lead the writers to emphasize the importance of replenishing a tuberculin-tested herd by home bred stock to the largest possible extent.

With regard to heifers, at the first test, 10 reacted out of 35 tested and a year later another 14 had reacted. A considerable proportion of these heifers had been bought mainly as calves, and in view of the disappointing results, it was decided to test all young stock over a year old at six-monthly intervals so that any infected animals would be found at an earlier age, with the double result that the spread of infection would be checked and the disposal of reactors facilitated with less loss. All reactors were at once removed to another set of buildings and kept there until ready for slaughter. No reactors, whether amongst the cows or young stock, have been sold for dairy purposes, and reacting cows, when in milk, are used for suckling calves which are sold for veal.

Since the adoption of the practice of six-monthly testing of all young stock over one year, and strict isolation of all reactors, much better results have been obtained and the authors state that "it would appear therefore, that by strict segregation of all reacting heifers at as early an age as possible the number of failures to pass can be kept at a very low figure".

The results generally are regarded as very encouraging and indicate certain precautions which should be taken by all who hope to build up a tubercle-free herd. Another factor which may have helped in raising the health standard of the herd is that since April, 1930, the cows have slept outside all the year round because there happens to be a dry, sheltered, convenient field for this purpose.

In another section of the report the extra costs incurred in the production of milk from tuberculin-tested herds are discussed. It is pointed out that much depends on what is taken as the "ordinary milk" basis. If the Grade A standard is taken as a basis, then the expenditure on improvement of buildings, washing and sterilization of utensils, cleaning the cows and cowsheds, necessary to attain this standard must not be charged, and the extra costs are thereby limited to the cost of testing, the loss due to the removal of reactors, and the possible adverse effect on the average milk yield of the cow. In estimating these costs, that of tuberculin testing is taken at from 0·45*d.* to 0·6*d.* per gallon of milk; the loss due to removal of reactors is variable and it is impossible to put a precise figure on this item but ½*d.* per gallon may be allowed. There have been instances in other herds, however, of sudden and unexplained increases in the number of reactors, and in such cases a large and serious loss is incurred; it is suggested that to meet such a loss another ½*d.* per gallon may be added to the costs with a view to covering the risk.

The report contains other interesting information on the feeding of the dairy herd and on the financial results over the five-year period and it is interesting to note that a loss during the first two years was converted into a profit during the last two years; the main factors contributing to this result have been reduced costs per gallon in labour, foodstuffs and depreciation and an increase in the price per gallon received for the milk. The average milk yield per head has not increased during the period but in addition to the loss to the herd of several good milkers which reacted to the tuberculin test, a severe outbreak of abortion in 1928 depressed the yields and added to the difficulties of obtaining a sufficient number of home bred stock.

Causes of Removal of Cows from Herds.

Investigations on this subject in different parts of the country continue in progress, and in two instances the results obtained over a period of two successive years have been published. The report (Ref. 3) issued by the Dairy Husbandry Dept. of the National Institute for Research in Dairying deals with the data collected through the Milk Recording Societies operating in the counties of Berks., Bucks., Dorset, Hants, Oxford and Northants. Information on the causes of removal was received from 470 herds in respect of 3,013 cows, and a study of the results confirms the conclusion arrived at previously that the most important cause of removal is sterility in some form or another. The authors have also tabulated the data according to counties, according to breed and according to different methods in herd management. The results obtained are interesting but are at present by no means conclusive, and a careful study of another year's data, with perhaps a more detailed investigation of the different aspects of management, will be necessary before definite conclusions can be stated. It may be mentioned, however, that a calculation by three different methods of the length of time a cow remains in one herd, gives results which are in close agreement and indicate that the average life in one herd is in the neighbourhood of 3¼ to 3½ years.

Garrad has carried out an investigation on this problem during two successive years with the aid of the Kent Milk Recording Society (Ref. 4) and he also finds that sterility is the main cause of disposal but concludes that the average milking life of a cow in any one herd is approximately four years.

Points in Cowshed Construction.

During the latter part of last century when the existing buildings on many farms were converted into cowsheds, there were many instances of mistakes in construction, such as too high mangers, too long stalls and a failure to provide sufficient light and ventilation. In more recent times, through the educational efforts of various authorities and the administration of the Milk and Dairies Orders, mistakes are less frequently made and reliable advice is easily obtained, but it is helpful to get the results of carefully conducted experiments on any definite points. At the Iowa Agricultural Experiment Station problems of the length of stalls and the most suitable kind of stall flooring have been studied by Giese and Cannon (Ref. 5). With regard to stall length, they conclude that the desired length may be ascertained from a measurement of the length of the cows from the shoulder point to the tail head and then deduct 1½ inches; also, in order to provide for the variation sure to occur in a herd of cows, they suggest that the length of the stall should vary throughout the length of a row of stalls, whereby the longest cows can be stalled at one end and the shortest at the other. The problem of the best materials for the floor of stalls is receiving much attention in this country at the present time and it is interesting to learn the results of the exhaustive tests carried out at Iowa. Of the several floor materials tested, the wear over a four-year period on Portland cement concrete and rubber paving blocks was so slight as to be almost negligible. The wood blocks (commercially manufactured and creosoted blocks and treated yellow pine blocks) would probably have shown but little more wear than the concrete and rubber if they had been laid in concrete rather than asphalt. Asphalt was used for sanitary reasons but was found to "flow" under continuous pressure even when it was cold and apparently hard. It should not be used as a foundation where concentrated and fairly continuous pressures exist.

Cork brick lasted fairly well when laid in cement mortar and when mortar was used in the spaces between the bricks so that their edges were protected. Mastic floors proved undesirable owing to the tendency of asphalt to flow under pressure, and where cows are tied in stanchions the pressure of the fore feet is more concentrated than that of the hind feet, and deep depressions are formed where each foot stands with ridges around and between. It is unfortunate that the relative costs of the different types of floor were not studied but it would appear that in spite of the apparent coldness of concrete, its durability, imperviousness and cheapness emphasize its usefulness for this purpose. If properly laid and finished with a wooden float it need not be slippery.

The suitability of different materials for stall floors has also been investigated by Fowler (Ref. 6) who states that six points must be considered, *viz.* durability, resilience, warmth, imperviousness, continuity and roughness. In an experiment in which ten stalls were laid with cement concrete (treated with carborundum dressing to prevent slipping) and ten with a proprietary asphalt preparation (consisting of cork, asphalt and granite chips) it was found that heifers tied up for the first time soon suffered from tender feet in the concrete stalls, whereas those in the asphalt-floored stalls showed much less signs of discomfort. On the other hand, the asphalt flooring was distinctly disappointing as regards durability; within two years hollows had formed where the fore and hind feet stood. Another asphalt preparation, which had shown excellent durability on roads, proved very unsatisfactory in cow stalls due apparently to the localized heat and pressure of the animals' hoofs.

Further experiments were then carried out on the construction and use of an improved type of concrete floor designed to be less cold. The principle applied was that of including air spaces in the concrete bed and in practice this was accomplished by laying cardboard tubes, of 1½-inch diameter, in continuous lengths along the length of stalls, adjacent tubes being laid ½ inch apart. These tubes were held in position on the foundation concrete by a frame and the cement aggregate poured over them, thus filling up the space between the tubes and to a depth of about 1½ inches over the tubes. After treatment with a special primer the concrete was coated to a depth of ½ inch with a special surfacer, which is claimed to be ideal for stall floors because it is smooth, non-slippery and durable yet retains an elasticity which renders it kindly to the feet. The temperature in small cavities made under the ordinary cement concrete floor and under the new floor was ascertained over a six-day period and it was found that the range of internal temperature of the new floor was about 10°F. higher than that of the cement concrete floor. It is also stated that existing concrete floors can, if desired, be reconditioned with the special surfacer at comparatively little cost. Details of the preparation and composition of the special primer and surfacer are not given, but such information may be obtained on application to the author.

II.—DAIRY CATTLE—TYPE, BREEDING AND MANAGEMENT.

Type in Relation to Production.

From time to time discussion—sometimes flavoured with exaggeration—arises on the value of external characters as indicators of milking capacity in dairy cows. Boutflour (Ref. 7) has recently stated that " during the last hundred years we have done our best to ruin our dairy cows by pinning faith on appearance", and a writer in *Hoard's Dairyman* (Ref. 8) after a brief survey of a number of investigations on this subject in relation to practical conditions comes to the following conclusions :—" (1) No definite relation has been shown to exist between type and production. (2) Dairymen realize that to buy cows for production on the basis of their external appearance is a hazardous undertaking. (3) According to investigational work, body weight affects butterfat production (total production of fat—not percentage of fat) more than any other single factor, there being a tendency to a greater production of fat as body weight increases. (4) There is probably no relation between width of head, spacing between the last ribs and quantity of waxy secretion."

Nevertheless, in spite of the above opinions and conclusions and the undoubted greater reliability of actual records of milk and fat production, type and external characteristics will continue to play a great part in the buying and judging of dairy cows.

Research work on the value of individual characteristics also continues and the investigation carried out by Garner on this subject (Ref. 9) adds to our knowledge. Garner commenced his work by measurements of height, length, depth and width of various parts of the cow's body on 500 Dairy Shorthorns in Berkshire but had to reject the results obtained because of the differences in the dairy and dual purpose types of this breed. He continued his study on 461 pedigree and grade milk-recorded Friesian cows of uniform type in Minnesota, U.S.A., and, after a careful analysis of the data collected, came to the conclusion that milk yield was significantly correlated with (1) length from withers to pins, (2) length from withers to hooks, (3) height at hooks, (4) height at pins, (5) circumference of chest, (6) circumference of barrel, and (7) area of milk wells. Of these different characteristics he considers the area of the milk wells the most significant and adds that farmers, with practice, may quickly find and measure milk wells with their fingers ; usually a large milk well will take the tip of the middle finger of a normal man's hand. No significant correlation with milk yield was found for other characteristics which commonly receive attention, such as length from hooks to pins, width at pins, wedge of barrel, double thickness of skin on the ribs and the udder. He concludes that the results obtained confirm the value of some of the points which stockmen consider in judging dairy cows and he emphasizes the need for considering all the points together though certain points deserve special consideration.

It is probable that the differences of opinion which have arisen as to the value of some external characteristics are due to some confusion of thought. It will be admitted that no external characteristics approach actual milk records in value as indicators of productive ability but milk yield is not likely to become the *only* basis of judgement. Evidences of capacity for food coupled with good health, and a type of udder that will "wear" well and not be readily subject to injury and chills, are points of real value and the *good dairy cow* must possess these in addition to high productive power.

Normal Growth of Dairy Cattle.

All breeders of dairy cattle are naturally interested in the rate of growth of their young stock and whether any particular animal has made satisfactory growth for its age and method of rearing and feeding. Most breeders can form their own opinion as to whether a calf or heifer at any given age has made the growth which might be expected but until recently no data has been collected in this country on the weight and size which dairy stock should be expected to attain to at definite ages.

Bartlett (Ref. 10), at the National Institute for Research in Dairying, has now collected information on these points from weights and measurements taken of the young stock (females) reared on the Institute's farm during the last two years, and the figures ascertained for normal weight and growth at different ages are given in the accompanying table.

The breed and conditions of rearing naturally affect the rate of growth, hence it must be explained that the figures relate to Dairy Shorthorns (non-pedigree and pedigree) of a good type. In the great majority of instances the calves were removed from their dams when four days old, and thereafter were pail fed, receiving on the average 40 gallons of whole milk during the first seven to eight weeks; when four weeks old, hay was given and a small allowance of a dry cake and meal mixture, which was increased to 3 lb. per head daily as quickly as the calves would take this amount. Calves born during the autumn and early winter were pastured during their first summer, but those born after January 1st were not usually allowed on pasture till their second summer. Animals under fifteen months old were usually wintered in covered yards but older animals were wintered out on a dry pasture. The grassland available for young stock was not of first quality, some being low-lying wet land and some on a gravelly soil. The rations fed in winter were probably better balanced than those given on many farms but on the whole the young stock were maintained in moderate yet good growing condition throughout the year and heifers were mated at an average size for the breed.

Normal Size of Dairy Shorthorn Cattle (Females) from Birth to Five Years of Age.

Age (Months)	Farrow Live Weight lb.	Height at Withers In.	Length of Body In.	Depth of Chest In.
At birth	90	29·5	24·8	11·8
3	193	34·7	31·3	15·4
6	330	39·3	37·2	18·5
9	425	42·1	41·8	20·1
12	510	44·6	44·6	22·0
18	720	47·6	49·0	24·0
24	860	49·7	52·4	25·7
30	965	51·1	54·8	27·0
36	1045	51·5	56·0	27·7
42	1075	51·7	56·8	28·0
48	1130	52·1	57·7	28·5
54	1170	52·4	58·6	29·0
60	1200	52·5	58·9	29·2

The above table shows that Dairy Shorthorn heifers when they have attained the usual service age of about two years, should weigh fully 7½ cwt. and be fully four feet high at the shoulder, also that there is slight but definite increase in growth up to the end of the fifth year of age.

The figures afford a useful standard whereby any breeder of Dairy Shorthorns, rearing young stock under commercial conditions, can judge if their progress has been satisfactory, and they also have a value for experimental work in that they may make it possible under certain conditions to dispense with a control group and thus make a larger number of animals available for experiment.

Information on these points has not yet been collected for the other dairy breeds of cattle in England but it is of interest to quote American results with other breeds. At the Iowa Agricultural Experiment Station, Espe and his colleagues (Ref. 11) have studied the growth rates of females of the Holstein, Ayrshire, Guernsey and Jersey breeds and the results obtained for live weights and height at withers at selected ages are given for comparative purposes.

NORMAL SIZE OF AMERICAN DAIRY BREEDS TO FIVE YEARS OF AGE.

	Live Weight				Height at Withers			
Age (Months)	Hol. lb.	Ayr. lb.	G. lb.	J. lb.	Hol. In.	Ayr. In.	G. In.	J. In.
At birth	89	63	65	50	—	—	—	—
3	182	143	132	114	33·6	31·0	31·2	30·5
6	358	288	262	235	39·6	36·3	36·9	36·2
12	662	536	490	451	45·9	42·4	44·4	42·4
18	885	700	661	607	49·3	45·3	46·4	45·5
24	1091	858	818	724	51·7	47·3	48·2	47·0
36	1159	970	901	830	53·2	48·9	49·9	47·8
48	1243	1036	990	883	53·3	49·4	50·4	48·4
60	1345	1071	1055	922	54·4	49·2	50·5	48·9

Breeding Records in Dairy Herds.

Reference was made in a previous issue of this review (Ref. 12) to the information extracted from the breeding records of the Minnesota University dairy herd over a period of 29 years on the proportion of conceptions to services, proportion of abortions, and on other points of great interest to those engaged in the breeding of dairy cattle. Another report of a similar nature (Ref. 13) has been published by the United States Dept. of Agriculture on the breeding records of the herd maintained by the Bureau of Dairy Industry at Beltsville. The results cover a period of eight years; during the first four years all the animals were handled together as one herd, although some were known to be abortion-positive and others abortion-negative, but in the second four years the herd was divided into an abortion-negative group and an abortion-positive group housed at new premises.

The percentage of living calves, abortions and dead calves in the two sections of the herd over the eight-year period were found to be as follows:—Abortion-negative animals: total pregnancies terminated, 256; living calves, 214 (83·59 per cent.); abortions, 19 (7·42 per cent.); dead calves, 23 (8·98).

Abortion-positive animals: total pregnancies terminated, 246; living calves, 172 (69·91 per cent.); abortions, 60 (24·39 per cent.); dead calves, 14 (5·69 per cent.). The higher percentage of dead calves in the abortion-negative group is attributed to a number of heifers which were unable to give birth to live calves. The number of services required for conception was greater in the abortion-positive section; over the eight-year period the number of services per conception amongst cows which had had a normal calving was 2·83, whereas amongst cows which had previously aborted, the number was 3·46. In view of the fact that the Beltsville Herd is kept for investigations in breeding, feeding and management it is not possible to say to what extent these figures apply to normal herds. In the Minnesota report referred to the figures were 2·52 services per conception, in the University herd which had suffered from abortion, and 1·61 in a private herd. The records obtained also gave further evidence of the known fact that abortion leads to sterility in a proportion of the infected animals but it was found that there was very little sterility in heifers and young cows. Of the 242 heifers mated, 5·27 per cent. became permanently sterile before reaching five years of age, 11·98 per cent. before reaching eight years of age and 16·94 per cent. before reaching 10 years.

The fertility of bulls was also studied and, as a considerable number of bulls of all ages were kept for different breeding experiments, some interesting conclusions were obtained. It is stated that with old bulls—six years and older—regular exercise seems to have a more beneficial effect on the genital functions than any other treatment, probably because exercise keeps the body muscles in normal tone and the animal is more vigorous, active and docile. Exercise is provided by yoking the animals to a circular exerciser and making them walk for approximately 1½ hours each day. In addition to regular exercise, the addition of sprouted oats to the ration is considered to have been helpful in maintaining breeding efficiency. The equivalent of 5 lb. dry oats was given when sprouted, each day; the oats were fed when the sprouts were ¼ to ½ inch long and a mass of white roots was present. The effect of season of year on fertility was studied from the records kept of 22 fertile bulls mated with fertile cows over a four-year period. The average number of services required for a conception during the first three months of the year was 2·80; during the second three months of the year 2·81; during the third three months 4·05 and during the last quarter 2·80. The breeding efficiency of young bulls—under six years of age—and old bulls—over six years—was also compared, and over a four-year period it was found that the average number of services to fertile females per conception was 2·28 for the young bull group and 3·83 for the old bull group.

The influence of the age of cows and of bulls on the number of services required for conception has also been studied by Morgan and Davis, using the records of the University of Nebraska herd (Ref. 14). It was found that for cows under two years of age 24 per cent. more services were required for conception than for cows of three years of age. There was little difference in the services required for conception with cows of from three to ten years when bulls of all ages were used. Yearling bulls showed the smallest number of services for conception, 11 per cent. fewer services being required than with two-years-old bulls and 15 per cent. fewer than with three-years-old bulls. There was little difference amongst bulls whose ages ranged from four to eight years. The results also indicated that young bulls are decidedly more effective on young heifers.

The Progeny Test and the Proving of Sires.

Previous issues of the *Farmer's Guide* have contained frequent references (Ref. 15) to the importance of judging the breeding value of a bull by his progeny rather than by his parentage and there is no doubt that this subject is receiving much more consideration than formerly by Breed Societies, Milk Recording Societies and herd owners. If reasons were needed for further discussion on the varied aspects of this subject, these are readily available in the importance of live stock breeding and the desirability that the formulation of schemes should take account of the different points of view.

Numerous articles have appeared in various journals and reports and it appears desirable to focus attention on the various factors which may be considered essential to the conduct and interpretation of progeny tests for the proving of bulls of the Dairy Breeds.

Edwards and Smith in an interesting article on this subject (Ref. 16) state that the following questions amongst others have to be considered :—What is to be defined as a lactation ; can records made under different systems of feeding be compared ; can a lactation made in the heifer year be compared with one made at a later stage ; can a bull proved by records made by twice-a-day milking be compared with one whose daughters are milked three times a day ; the number of daughters necessary to give a reliable indication of their sire's milk transmitting ability and the possible effect of the level of their dams' production. Some additional points of importance are the reliability of the parentage of the daughters, the method of ascertaining the lactation period fat percentage, the use of unselected daughters' records and the attention, if any, to be given to the type and conformation of the daughters.

An attempt will be made to summarize the various points of view on the above-mentioned points, but not in the order given above.

Identification of Daughters. The basis of progeny tests must be the performance of a number of the daughters of any particular bull. It would appear essential, therefore, that the parentage of the daughters should be beyond dispute, hence these must either be pedigreed stock, registered in the Herd-book of their breed within a short time of birth according to each Breed Society's regulations, or marked as calves for future identification according to the calf-marking scheme of the Ministry of Agriculture or according to some other authoritative scheme.

Definition of Lactation Period. The milk records of the daughters must be records made under the auspices of a Milk Recording Society operating under the Ministry's scheme or under another scheme of recognized authority. Edwards and Smith (Ref. 16) suggest that records for a lactation period of 315 days after calving (excluding four days suckling) might be used in progeny tests, but it is probable that different Breed Societies might wish to adopt a lactation period of different length. The definition of "lactation period" might be left to each Breed Society to decide for itself, provided the yield of milk is duly authenticated by a Milk Recording Society.

Number of Daughters necessary. The number of daughters necessary to provide sufficient proof of their sire's dairy qualities has been discussed by numerous American workers but Edwards (Ref. 17) points out that their deductions are as a rule based on Advanced Registry records only, and are therefore not directly applicable to English conditions. Edwards has studied this point and gives a table showing the extent to which the accuracy increases with the number of daughters. In a comparison of two sires, each with three daughters, it is shown that the difference between the groups of daughters would need to be greater than 3,188 lb. before it could be stated that one sire was significantly better than the other; with six daughters the margin required is narrower—2,253 lb.—and with ten daughters it still amounts to 1,746 lb.

Unselected Daughters necessary. It is also essential that the daughters should be "unselected", *i.e.* the poor yielders must be included as well as the good yielders and Edwards ventures the suggestion that the minimum number of unselected daughters necessary to give a reasonably accurate indication of their sire's transmitting ability is six. It is important that the degree of accuracy attained by such an indication should be realized and that provision should be made for collecting the records of the largest possible number of daughters to increase the reliability of the results. Instances will no doubt be found where one or more daughters showed such little promise after calving, that they were used for suckling calves or were dried off and sold for slaughter long before a normal lactation period would be completed. Such instances must be included amongst unselected daughters and the facts stated. In this connexion Edwards and Smith wisely lay stress on the importance of knowing the individual records comprising the daughters' average yield and quote (Ref. 16) two instances—in (a) eleven daughters have an average age-corrected yield of 9,018 lb. but range from 4,789 lb. to 12,213 lb. ; in (b) nine daughters have an average age-corrected yield of 8,850 lb. but range from 8,000 lb. to 9,820 lb. The sire of the latter group is definitely to be preferred as he begets a greater proportion of high yielding daughters.

Consideration of the Yield of Dams. The question as to whether the production level of the dams of the daughters should be taken into account has also given rise to vigorous controversy, mainly in connexion with the different methods of calculating the so-called "Bull Index". Many writers emphasize the need for taking account of the dams' milk yields on the basis that the progeny inherit their good and bad qualities from both parents and that in the case of a quality such as milk yield, which is now considered to be due to the inter-action of a number of different factors, the contribution of both parents may be taken as approximately equal. From this point of view it would appear most desirable that the production powers of the dams should be taken into account. On the other hand, Gifford of the Missouri Agricultural Experiment Station (Ref. 18), found that the average yield of a group of daughters, without considering the production of the dams, more nearly predicted the production level of other daughters than methods which took account of the dams. Also the American Jersey Cattle Club, according to Copeland (Ref. 19), does not take the dams' records into consideration because the record of a cow does not give much of an indication as to her hereditary make-up or what she will transmit to her progeny. This also is quite true as many breeders can testify from their own experience. Graves, of the Dairy Cattle Division of the United States Dept. of Agriculture, in a discussion of this problem (Ref. 20) urges that it is the function of the cattle clubs (Breed Societies) to publish the complete information that they possess regarding a sire's transmitting ability so that any one who desires to study the evidence bearing on the inheritance possessed by an animal could apply to that evidence such indexes or such "yardsticks" as he may see fit to use. On the other hand, if only part of the information is published, or if the information published is according to some one index, or if a list of sires is published that are labelled "superior" or other title, breeders may be misled because the standard used may prove later to be incorrect or the material published may be too brief for intelligent interpretation. Graves' wide experience in the selection of bulls for the Department's experimental breeding herds entitles his views to careful consideration, although it will quickly be obvious that it is necessary to decide whether parents' records only, or these, with such details as may be available for the grandparents, etc., should be given; also in the case of aged bulls the space required may be a matter requiring careful thought.

Comparison of Dams' and Daughters' Yields. The question of comparing the yields of daughters and dams also brings forward the problem of "correction factors". It will be obvious that a fair direct comparison between dam and daughter (the so-called dam-daughter pair) can only be made when both have been reared under similar conditions, calved their first and second calves at approximately the same age and have been managed, milked and fed under fairly comparable conditions. Herd owners also know how rarely such a fair direct comparison can be made in actual practice, hence the need for correction factors, in so far as these may justly be used, to enable the production records of animals of different ages and management to be compared.

Adjustment to Age. Increase in age is known to have a marked effect on the milk yield and numerous workers have devised factors whereby the estimated yield at maturity (say when six to eight years old) may be calculated from the yield at an earlier age, and in this way animals calving at different ages can be compared on the basis of an estimated mature yield. Sanders, in his study of English Milk Recording Society data on this subject (Ref. 21), suggests the following additions to the respective lactation yields to give the estimated yield at maturity :—To 1st lactation yield add 30 per cent., to 2nd lactation yield add 18 per cent., to 3rd lactation yield add 10 per cent. and to the 4th lactation yield add 4 per cent. Kay and McCandlish (Ref. 22), after studying data obtained from recorded herds of Ayrshire cows in Scotland, suggest a lower range of factors :—To the lactation yield of heifers calving at three years of age add 16 per cent., to the lactation yield of four-year-olds add 12 per cent., to the lactation yield of five-year-olds add 6 per cent. and to the lactation yield of six-year-olds add 3 per cent. In this connexion the Dairy Shorthorn Association (Ref. 23) have for some years required minimum milk yields for the registration of heifers and cows as "qualified bull breeders" as follows: heifers calving under three years three months—5,500 lb., cows calving between three years three months and four years three months—6,500 lb., and cows over four years three months at calving—8,000 lb. If we assume that these three age groups represent the 1st, 2nd and 3rd lactations, then the percentage additions accepted by the Dairy Shorthorn Association are to 1st lactation yield, 45 per cent. and to 2nd lactation yield, 23 per cent. The differences between these sets of correction factors is more easily appreciated when illustrated by a specific milk yield, *e.g.*

Assume yield of heifer calving at 3 yrs. old to be 5,500 lb.	Kay & McCandlish	add	16%	=6,380 lb. =mature yield.
	Sanders	adds	30%	=7,150 lb. =mature yield.
	D.S.A.	adds	45·4%	=8,000 lb. =yield after 3rd calf.

The differences between the mature yields, according to the conversion factors used, are so great that it will be obvious the subject requires further study. It should be mentioned that Kay and McCandlish, and Sanders arrived at their conclusions after a careful study of actual records, whereas the Dairy Shorthorn Association method was decided on by a committee of breeders for use by the Association and has been used without appreciable adverse criticism for eight years; also a study of the records of a number of Dairy Shorthorn herds supports the Breed Society's method. The differences between the mature yields, according to the conversion factors used, are so great that it will be obvious the subject requires further study before any one set of correction factors for age can be recommended for general use. If the above-mentioned factors for Ayrshire cows should be confirmed it may be that different factors would be necessary for different breeds.

Adjustment for Dry Period and Service Period. Sanders has also studied the effect on the milk yield of a lactation period of (a) dry periods of varying length before calving, (b) periods of varying length between calving and service, and (c) calving at different seasons of the year, and has suggested correction factors for each of these (Ref. 24). Edwards and Smith (Ref. 16), commenting on the use of such factors, make the point that for progeny recording of bulls the treatment of the records must be simple and accurate; they also compared in three cases the results obtained by the use of age-correction factors only and by the use of correction factors for age, dry period and service period, and find marked agreement; they conclude that correction for age alone is required where the records of a sufficient number of daughters are available.

Adjustment for Frequency of Milking. The lactation yields are also known to be influenced by the frequency of milking and in some instances in this country correction factors are employed to equalize the yields from cows milked twice and others milked thrice or four times daily (Ref. 23). There is some evidence, however, that heavy yielding cows give a proportionately greater response to more frequent milking than do low yielders, hence the use of a uniform correction factor cannot be completely justified and an attempt to use different factors for yields of different levels—if such could be agreed on—would make the comparison of progeny records still more complicated.

Adjustment for Management. The comparison of records made by dams and daughters under different systems of feeding and management is admittedly very difficult, and where the difference is between bad management and really good management no just comparison is possible and no correction factors can be suggested which have any value (Ref. 16). It follows, therefore, that the student of progeny records should have, in addition to authenticated records of dams and daughters, a knowledge of the general standard of management and feeding maintained in the herd or herds concerned. Without such knowledge his interpretation of the records may be incorrect. In America a standardized system of management on a high plane has been adopted at some centres to facilitate the interpretation of the results obtained in constructive breeding; in the course of time a uniformly good system of feeding, milking, etc., may have been employed in some of the herds in this country and progeny tests results obtained in such herds will have a correspondingly greater reliability.

Consideration of Fat Percentage. In addition to records of milk yield, progeny tests should take account of the fat content of the milk so that sires may be discovered which maintain or increase the quality as well as increase the yield of milk. Numerous instances can be quoted from butter-producing countries showing that a bull may effect an increase or a decrease of both milk yield and fat content, or may increase one and decrease the other. In this country the testing of the milk of individual cows has been greatly neglected, even in bull breeding herds, and it is only recently that the Ministry of Agriculture has grafted on to its Milk Recording Scheme the necessary regulations to enable the fat content of the milk of an individual cow to be ascertained for a lactation period by a reliable and uniform method (Ref. 25). The risk that heavy yielding daughters of a particular bull may be producing poor quality milk is a real one, hence it is important that progeny tests should include a study of the quality as well as the quantity of the milk produced, and that, when lactation period fat percentages are given, these shall be determined by a trustworthy method.

Inspection of Progeny. An important step towards placing the progeny test and the proving of dairy bulls on a systematic basis has been taken by the Central Council of Milk Recording Societies. A draft national scheme for progeny recording has been prepared and circulated to Milk Recording and Breed Societies for their comments, and, arising from this action the suggestion has been made that before bulls are classified as " proved " or " proven," their progeny shall be inspected and passed as suitable as regards type, conformation, shape of udder, etc. This suggestion has been embodied in the regulations of the Cumberland and Westmorland Dairy Bull Testing Association (Ref. 26), but Edwards (Ref. 27) argues that inspection of the progeny is not necessarily an essential part of a national scheme of progeny recording. He points out the difficulty in any national scheme of drawing up uniform standards for type, character, conformation of udder, etc., and states that such matters are chiefly the concern of the respective Breed Societies. It would be possible for each Breed or other Society to inspect the progeny of sires in which it was interested as is done by the Cumberland and Westmorland Society referred to, and, as it is quite possible that progeny showing good milk yields may also have definite weaknesses in breed type and conformation, it is natural that Breed Societies should wish to avoid the risk of unduly honouring the sire of such daughters.

The foregoing survey of the points which require attention in the conduct of progeny testing shows that at the moment it is very difficult to decide on the best procedure on many points, but the application of the principle of progeny testing is of such importance in the breeding of better stock that it is essential that all those interested should give the whole subject most careful study in order that the most reliable and workable scheme may be brought into practice. It may be that in the development of a scheme which can be operated without too much complication, several of the above-mentioned points cannot be taken into account, but it is important that breeders and others should realize the significance of such points as well as those which can receive adequate consideration.

Influence of Age at First Calving.

The age at which the heifers of the Dairy Breeds have their first calf varies appreciably with the breed and also varies from district to district for individual breeds. In the Jersey and Guernsey breeds heifers usually have their first calf at 2 to 2½ years, whereas the heifers of the larger breeds are as a rule approximately six months older; with Dairy Shorthorns, however, the custom in some pedigree herds and to a certain extent in Cheshire is to have heifers calving when about 2½ years, whereas in the south of England about three years is a more common age.

The custom with individual breeds and herds depends on a variety of factors such as size of the heifer, time of calving in relation to the demand for milk, and the degree of reliance placed on the belief that calving at an early age contributes to a development of the milking qualities. Very little experimental work has been done on this subject, although the age at which a heifer may become productive is definitely of economic importance. One reason for this lack of scientific data is the difficulty of getting a sufficient number of heifers, maintained under comparable conditions and calving at different ages, to warrant the drawing of conclusions, and there is always a risk that inferences from a small group may be incorrect by reason of the individuality of the animals.

An attempt was made by Eckles (Ref. 28) to study this subject, using groups of Jersey and Holstein heifers, and although the number of records available for examination was not large, he ventured the opinion that from the standpoint of securing the greatest development as a dairy animal, it is disadvantageous for a Jersey to calve under 24 months of age, but nothing is gained by allowing the heifer to reach an age of more than 30 months. In Scotland, McCandlish (Ref. 29) has studied the life-time production (in terms of average output per lactation period) of heifers calving at different ages and concludes that the best age at which to calve Ayrshire heifers is around 2½ years, and that there is nothing to be gained, so far as ultimate production is concerned, by delaying the date of first calving beyond this age. He also found that the customary age at calving was from 33 to 36 months old. In so far as these animals were on cheesemaking farms where calving is concentrated into the spring months, the method of disposal of the milk controlled to a large extent the age at which the heifers calved. More recently, Turner (Ref. 30) has attempted to obtain further information on this subject by studying the Advanced Registry and Register of Merit records of the four chief American Dairy Breeds—Holstein, Ayrshire, Guernsey and Jersey. The limitations of data from these records are recognized but the uniform high level of management of the cattle and the large number of records studied contribute to the value of the conclusions. Turner asks the question—Should heifers calve at 24 months, 30 months or 36 months? and answers that efficient milk and fat production will be obtained by calving at 24 months, that from 24 to 30 months there is a definite increase with age at calving but that after 30 months of age in all the above-mentioned breeds the increase is practically negligible ; in other words, every heifer remaining unproductive at 30 months of age or over is being maintained at a loss not only of the maintenance cost and of the investment on the animal, but in the productive life of the animal. This conclusion applied only to animals which have made normal growth ; if animals are seriously stunted up to that age and are capable of making extensive gains in body weight later, the potential production would be increased accordingly. Turner, however, does not wish to imply that all animals under all conditions should calve at any certain time or that any definite age of first calving can be established. Varying conditions and the objectives of breeders must determine the most satisfactory age.

III.—Secretion of Milk and Milking.

Hand Milking.

The practice of hand milking is primitive in its simplicity and the mode of operation has probably changed little during several centuries. It is interesting, therefore, to find that this old yet universal part of dairy farm work has been studied anew by Dunlop under the auspices of the National Institute of Industrial Psychology (Ref. 31). The investigator studied the work of hand milking on farms in Kent and his report is interesting, firstly, because of the new phrases used to describe old facts, *e.g.* " The essential point, then, is that in milking we have to consider both the milker and the cow. Each possesses individuality, each is influenced by environment and each is influenced by the other, and also, it may be added, by the owner ", and secondly, because the investigation brings forward several points which are well worth careful attention.

The rate of milking of different cows by three different milkers was studied with the aid of a stop-watch and it was found that the average daily rate of milking ranged from 1·4 lb. to 1·0 lb. per minute at the morning milking and from 1·25 lb. to 0·9 lb. per minute at the afternoon milking. The rate of milking naturally varied with different cows but actual details are not given. The effect of such factors as " holding-up ", hardness, temperament (of cows) and skill of the milker are discussed in the light of the results obtained, and, although it is recognized that conclusions based on a limited amount of data require to be checked by further investigations, it is suggested that the rate of milking could be increased (a) by the elimination from the herd of constitutionally " hard " cows, of " holders " and of " kickers " which are not exceptionally heavy milkers, (b) by the selection of milkers based upon the qualities needed, both (i) temperamental and (ii) physiological, (c) by the training of milkers, (d) by taking every practical measure (i) to reduce the number of flies, (ii) to improve ventilation, lighting, etc., (iii) to prevent kicking by the cows. In addition, it is suggested that the ordinary three-legged milking stool would be more satisfactory if its height were adjustable to suit different cows, and that artificial light should be diffused, to avoid deep shadows, and placed to throw the light on the cows' hind quarters and udders. The experienced practical dairy farmer will no doubt say he "knew all that before", but, as in advertisement, repetition may be effective in helping him to realize that in the three-fold partnership engaged in milk production—the owner, the cowman and the cow—it is the owner who should organize the order of work, introduce new methods and generally take the lead.

Another aspect of hand milking has been studied by Boyes and McClemont (Ref. 32), namely that of milking with clean dry hands, with clean wet hands and with clean dry hands lubricated with vaseline. An experiment was carried out in which the dry-handed milkers washed their hands thoroughly in soap and water and dried them on a clean towel before starting to milk each cow. The wet-handed milkers washed and dried their hands, but moistened them with milk before and during the progress of milking, while those milking with greasy hands washed and dried their hands, but rubbed them with a small portion of clean vaseline before starting to milk. Thirty samples of milk were taken under each method of milking, and each sample was examined for presence of B. coli, total bacteriological count and sediment test. The results for each lot of 30 samples may be briefly summarised as follows:—*Absence of B. coli*:—dry milking—absent in 30 samples; wet milking—present in 15 samples; greasy milking—present in 14 samples. *Bacterial Count*—number of samples with under 10,000 colonies per c.c.: dry milking—28; wet milking—19; greasy milking—25. *Sediment Tests*—average score: dry milking—72·5 per cent.; wet milking—31·8 per cent.; greasy milking—54·6 per cent. In every respect milking with clean dry hands gave the best results.

Methods of Drying-Up Cows.

From time to time dairy farmers are confronted with the problem of how to dry-up a cow either because she is a persistent milker or because it is desired to fatten her as quickly as possible. The method usually adopted in this country is to cease stripping or to milk every alternate milking followed by still wider intervals, or a combination of these methods. In recent years some attention has been given to the method advocated by Boutflour of simply ceasing to milk the cow and at the same time cut down the food supply (Ref. 33) and a number of herd owners have used this method with success.

There has, however, been little experimental work done on this subject and it is interesting to have the results obtained by Wayne, Eckles and Petersen (Ref. 34) of the University of Minnesota on the effect of different methods of drying-up cows upon milk production. The methods mentioned above were studied and were designated incomplete milking, intermittent milking and complete cessation of milking.

The first step was to find out the method of drying-up usually practised and replies from 236 dairy farmers showed that 76 per cent. adopted the intermittent method, 16 per cent. adopted the complete cessation method and 8 per cent. the incomplete milking method.

Experiments on the different methods were then begun, including a study of the condition of the udder at the commencement of the next lactation period and the rate of milk production. The experimental method adopted was that of milking one half (left or right) of the udder by one method and ceasing to milk the other half. This method was based on the knowledge that the right and left halves of the udder are independent of each other.

The results of experiments using 18 cows show that complete cessation of milking can safely be recommended as a method for drying-up cows producing up to 20 lb. of milk daily, and that the drying-up process will be accomplished more quickly than by incomplete or intermittent milking. When milking is discontinued the udder will fill up until a pressure great enough to stop secretion is caused in the milk gland; after secretion is stopped the milk is gradually resorbed from the gland until it becomes dry. On this basis it is a mistake to milk out a cow during the resorption period as this releases the pressure within the gland and secretion is again encouraged and the drying-off period is prolonged. No significant difference was noted in the quantity of milk either as a whole or from the different halves of the udder, in the lactations following the drying-up of cows by the three methods used. Further study by Wayne and Macy (Ref. 35) indicate that drying-up by complete cessation of milking had no marked effect on the bacterial content of milk obtained in the subsequent lactation period.

IV.—COMPOSITION OF MILK.

Variations in Composition under Normal Conditions.

The ordinary analysis of milk gives the composition under the heads of (1) fat, (2) proteins, (3) milk sugar, (4) ash and

(5) water. From the usual view point of the producer and distributor of milk these constituents are considered simply as the fat and solids-not-fat (comprising 2, 3 and 4 above) because the Milk Regulations under the Foods and Drugs Act state that milk, offered for sale, if containing less than 3 per cent. fat and 8·5 per cent. solids-not-fat, shall be presumed to be not genuine until the contrary is proved. This requirement is a potent stimulant to the study of the composition of milk, but in addition to the fat and solids-not-fat content, considerable attention has been given in recent years to the ash or mineral content, particularly as regards calcium and phosphorus, the acidity, the reaction to the rennet test and the freezing point of milk.

It is well known that various conditions necessary to the management of cows and the production of milk have different effects on the composition and in order to get a clear understanding of the results under one set of conditions and to provide a basis for comparison, the National Institute for Research in Dairying has investigated the composition of milk as produced under typical South of England conditions and has reported (Ref. 36) on the results obtained in a period of three successive years, October 1st, 1928, to October 1st, 1931.

For this work ten Dairy Shorthorn cows of varying ages and calving at different times of the year were chosen to constitute a typical small herd, and from October 1st, 1928, onwards the management and feeding was on uniform lines, resembling the common practice in a well-managed herd in the south of England. Of the ten cows originally chosen, eight continued throughout the three-year period and the average milk yield (for the milk-recording year of twelve months) was as follows: 1928–29, 9,355 lb. (10 cows); 1929–30, 8,532 lb. (9 cows); and 1930–31, 8,820 lb. (8 cows). The health and breeding records through the period were good; the only serious disturbance was an attack of "husk" in June and July, 1930; the average lapse of time between calvings, based on 17 intervals, was 394 days (13 months) which probably represents good average conditions for a lot of eight to ten cows that have had from one to seven calves.

The management involved the housing of the cows at night from late October to April, with a few hours grazing and exercise during the daytime, except in rough weather, and from late April to October they were in the pastures day and night.

The feeding was on the usual maintenance and production lines. During the autumn and winter the maintenance part of the ration consisted of meadow hay with cabbage, marrow stem kale and mangolds as the season advanced. During the summer, pasture constituted the sole food as far as possible, supplemented when necessary by green forage crops; in 1929 a serious drought ended the full grazing season by mid June, and green lucerne, vetches and oats, and silage were used in succession to September, when feeding on winter lines was commenced; in 1930 a larger supply of pasture was available but the outbreak of "husk" made it necessary to remove the cows from their usual pasture and to give green fodder and hay until October; in 1931 abundant pasture was available up to September, after which date green lucerne was given until the use of cabbage was commenced at the end of the month. It will be noticed that the three summer seasons showed marked contrasts in the proportion of pasture available. The concentrates given during each winter consisted of a mixture of 3 cwt. dried brewers' grains, 2 cwt. maize germ meal and 1 cwt. soya bean meal, and the amount given was 3½ to 3¾ lb. per gallon of milk. During the summer concentrates were given to cows yielding over 3–4 gallons daily and as the season advanced the allowance was increased as was thought desirable. The foods used were equal weights dried brewers' grains and maize germ meal, with the addition of a small proportion of soya bean meal as the season advanced. Although the same foods were used throughout the three-year period it is noted that all the cows ate their allowances readily and showed no signs of tiring of the mixture. Rock salt was placed in the mangers and in the pastures from time to time but no other minerals were supplied.

All the cows were milked twice daily by hand and as a rule the milking hours gave a day interval of nine hours and a night interval of 15 hours. The yield of milk was weighed and sampled at each milking for each cow and subsequently composite samples were made up in the laboratory as required.

The percentage of fat and solids-not-fat in a composite sample were determined for 1,074 mornings and 1,061 evenings throughout the period and it was found that of the morning's milk, 147 samples (13·7 per cent.) contained less than 3 per cent. fat, the lowest being 2·4 per cent.; 796 (74·1 per cent.) contained between 3·0 and 3·5 per cent.; and 131 (12·2 per cent.) contained over 3·5 per cent. fat. Of the evening samples 17 (1·6 per cent.) were under 4·0 per cent., the lowest being 3·6 per cent.; 531 (50·1 per cent.) were between 4·0 and 4·5 per cent.; and 513 (48·3 per cent.) were over 4·5 per cent. The periods of low fat content occurred during the early summer months and the highest tests occurred during October and November. The solids-not-fat content of the morning's milk was under 8·5 per cent. in four samples (0·4 per cent.); from 8·5 to 9 per cent. in 870 samples (81·0 per cent.); and over 9 per cent. in 200 samples (18·6 per cent.). Of the evening samples 26 (2·5 per cent.) were under 8·5 per cent.; 989 samples (93·2 per cent.) were between 8·5 and 9 per cent.; and 46 (4.3 per cent.) were over 9 per cent. The periods of low solids-not-fat were from June to August and the occasions when the average fell below 8·5 per cent. coincided with the attack of husk and consequent changes in feeding in July, 1930; at this time the percentage of fat was quite satisfactory. The highest solids-not-fat content occurred during October and November each year.

Weekly composite samples were prepared from the daily composites and each week the percentages of ash, calcium, phosphorus and nitrogen were determined, also the acidity and the rennet test. With the exception of the latter there was a marked uniformity in the content of the samples throughout the three-year period. The average content for each year was as follows:—Ash—0·78, 0·77 and 0·78 per cent.; calcium—0·127, 0·124 and 0·131 per cent.; phosphorus—0·108, 0·107 and 0·104 per cent. A slightly higher calcium content was found each autumn when cabbage and kale constituted part of the ration. The rennet test, used to determine the time of coagulation with rennet, showed marked variation according to the season of the year; the time taken to coagulate a standard quantity of milk at the same temperature was almost twice as long in winter as in summer, yet none of the milk constituents studied showed any corresponding variation.

Acidity of Milk.

The acidity of samples was very uniform throughout, ranging from 0·14 to 0·18 per cent. with an average for each year of 0·16, 0·16 and 0·15 per cent. There were indications of a slightly lower acidity when the cows were on pasture. The question of the acidity of milk and the degree of variation under different conditions is becoming of greater interest to dairy farmers since a number of firms of milk buyers make use of the acidity test to determine the condition of the milk on arrival at their premises. Recent work in this country has shown that there may be a considerable variation in the acidity of the milk obtained from the different quarters of the same cow at any milking (Ref. 37) and that the degree of acidity declines as the lactation period advances (Ref. 38). In other countries this test has been in use for years, mainly in respect of milk delivered to condenseries and milk powder factories. In some instances milk with an acidity exceeding 0·18 per cent. has been rejected as unsuitable (Ref. 39). It has also been shown that the acidity varies appreciably in samples from individual cows and to a less extent from farm to farm and the use of the test has been criticised on the basis that milk will show an apparent acid condition immediately after milking and before any lactic acid—the cause of sour milk—has had time to develop. A study of this subject in the United States some years ago (Ref. 40) showed that the average acidity of herd composite milk as received at the factory was well below 0·18 per cent., though there was evidence that individual cows of certain herds and breeds gave milk of higher acidity, and that, in commercial practice milk was not rejected on the basis of titratable acidity alone, for an acid test was resorted to only when the odour and flavour suggested to the experienced inspector that the condition of the milk was doubtful.

There is also evidence to show that when milk is cooled immediately after milking and kept at a low temperature, the development of acidity is slow and it is from this aspect that that use of the acidity test may appeal to the buyer of milk. At the same time it is necessary that those who make use of the test should realize its limitations as well as its value.

V.—Taints and Flavours in Milk.

Detection of Taints and Flavours.

The occurrence of objectionable flavours and taints in milk on the farm, in the depot or in the consumer's house is one of the worries associated with the Dairy Industry. In previous issues of this review the taints and flavours due to different foods and to the action of metals, etc., on milk have been discussed (Ref. 41) and recently a comprehensive summary of the various causes and conditions which may bring about objectionable flavours has been published by Leitch (Ref. 42). The same subject naturally receives attention in other countries and a paper read recently before the International Association of Milk Dealers in the United States deals with certain aspects of the taint problem in an interesting manner (Ref. 43). It is observed that one noteworthy point is the helplessness of some milk producers and distributors in identifying a flavour or locating the cause and another is the tendency to give the same flavour a variety of names. These difficulties are so well known in this country also that certain recommendations as to the method of detection of taints and flavours given in the paper referred to are worthy of reproduction.

"When it is said that milk has a certain flavour, the implication is made that there is a certain pleasantness or unpleasantness connected with it. The term 'flavour' is frequently misused, referring neither to the taste nor to the smell, but to the blending of both taste and smell. Strictly speaking, it refers to taste only . . . . We actually taste four different things and four only. These are sweet, sour, salt and bitter. Different areas of the tongue seem to be partial to these different tastes. Bitter seems to belong chiefly to the tip and to the back part of the tongue, the tip seems to respond best to the sweet and salt while the sides seem to be mostly responsible for sour."

Occasionally men are found who, though apparently normal in taste and smell, are unable to analyse the flavour of a milk sample. A definite procedure for the study of milk flavours is suggested and a summary of this procedure is given below.

1. The milk taster should fix the ideal flavour in his mind and learn to recognize it and in what respect a sample contrasts unfavourably with that ideal. He should bear in mind that normal whole milk is pleasantly sweet, possessing neither a foretaste nor an aftertaste other than that imparted by the natural richness of the milk.

2. He should secure a representative sample; if in a bottle, the bottle must be well shaken before removing the cap; as some flavours are associated with the fat, the flavour of the top milk may not be indicative of that of the entire sample.

3. The milk should be heated to 85° to 95°F. before tasting and smelling.

4. The aroma should be noticed immediately a portion of the milk is poured out; if no odour is noticed then the possibility of certain taints is at once eliminated.

5. Take into the mouth a sample large enough to be representative, yet small enough to permit manipulation within the mouth, then move it about the mouth, roll it finally to the back palate and then reject it. After tasting the empty mouth, draw a breath of fresh air very slowly through the mouth and exhale it slowly through the nose. Practice will enable the taster to detect even the faintest odours.

6. Also agitate the milk by rotating the bottle or the beaker and note any odour arising. The thin film of milk left on the surface of the glass evaporates rapidly and this facilitates the detection of odours.

7. Note particularly the first flavours and aromas which appear. This first impression is generally a true index as to what is present; also some flavours do not become evident until the mouth is emptied.

8. Observe only the flavours and aromas present. Do not form the habit of trying to detect objectionable flavours and defects as this leads to imagining almost anything. It is

advisable to have duplicate samples with different numbers or letters so that one's judgement may be confirmed or shown to be unreliable.

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I.—FOOT-AND-MOUTH DISEASE.

IN the *Farmer's Guide to Agricultural Research in* 1931 an account was given of investigations published in the Fourth Progress Report of the British Foot-and-Mouth Disease Research Committee. This voluminous report contains so much information of interest to agriculturists that further reference to it must be made here.

CULTIVATION OF THE VIRUS.

In *Agricultural Research in* 1925 and in *Agricultural Research in* 1927 (Refs. 1 and 2) mention was made of the numerous attempts at cultivating the virus of foot-and-mouth disease under artificial conditions outside the body. It must be recalled that the causal agent of this disease belongs to the class of ultravisible or filterable viruses. This means that in contradistinction to ordinary bacteria these viruses are beyond the limits of microscopic vision and largely by virtue of their small size they are capable of passing through filters which retain visible bacteria. While it has proved possible to induce the great majority of ordinary bacteria to grow under artificial conditions, until the last few years attempts at procuring growth of ultravisible viruses have almost always ended in failure. Thus there were grounds for thinking that, if viruses were to be cultivated at all, quite special conditions would be required. There was at the same time evidence of a more positive nature as to the correctness of this surmise, since under natural conditions viruses apparently multiply within the cells, of which the body is composed, and not at all or only to a limited extent in the body fluids. It was logical, therefore, to imagine that for the successful artificial cultivation of viruses of this nature the presence of living body cells might be essential. At this point it is necessary to refer to the enormous possibilities in biological work which were opened up by the discovery, made some 25 years ago, that certain cells of the body can not merely be kept alive, but can actually be induced to multiply after being removed from their natural surroundings. A striking example of this so-called tissue culture is that of certain cells which were taken from the body of an embryo chick in 1912 and were still actively multiplying under artificial conditions at least 12 years later. Among the fields of research to which this original discovery has been applied is that of cultivating invisible viruses. One of the first successes was with the virus which causes vaccinia or cow-pox, but a number of others have since been added to the list. In the case of foot-and-mouth disease it is gratifying to be able to report that the virus has now been cultivated by M. C. and H. B. Maitland (Ref. 3) working at the Public Health Department, Manchester, on behalf of the British Foot-and-Mouth Disease Commission. At about the same time and quite independently the causal agent was cultivated by F. Hecke (Ref. 6) at the Foot-and-Mouth Disease Station on the Island of Riems, Germany. In the British investigations the culture medium was put up in small glass flasks and consisted of the minced lips, tongue and soles from the feet of embryo guinea-pigs, and this was suspended in the blood plasma of guinea-pigs. It was found that in this medium minute quantities of virus, taken from the blebs which form on the feet of guinea-pigs after experimental inoculation, had multiplied considerably after three or four days' incubation at body temperature. In many of the flasks after this time the virus had multiplied a thousand times or more, and in one case one hundred thousand times, the amount of increase in all cases being estimated by noting the extent to which the contents of the culture flasks could be diluted before and after incubation without the infective power for guinea-pigs being lost. Small amounts of virus removed from the first flask, filtered and added to a second flask showed a similar increase on incubation. In this way between the months of March and December, 1929, the virus was transplanted through 17 successive generations. Although, therefore, the virus had been outside the body for nine months, the contents of the last flask in the series was still capable of infecting guinea-pigs when diluted ten thousand times. It was calculated that the original virus, if any of it were still present, would have been diluted many million million times, making the evidence of real growth indubitable. As a result of life outside the body the virulence, that is, the disease-producing power of the virus for guinea-pigs, did not appear to have changed. Moreover, it was proved that guinea-pigs which had recovered from the effects of inoculation with culture virus were immune to the natural virus.

The reader may be inclined to ask whether any practical advantages are to be derived from the successful cultivation of this or any other filterable virus. In reply it may be stated that, apart from the opportunities of acquiring more information as to the exact nature or properties of viruses, artificial cultivation might prove to be a means of obtaining with ease large quantities of virus which could be used in attempts at vaccinating susceptible animals. With the experimental conditions at present available, however, it cannot be said that this object has yet been attained, with one possible exception, namely, the occasional use of cultivated cow-pox virus for vaccinating human beings against small-pox. With foot-and-mouth disease there would be a special advantage in that artificial cultivation would do away with the necessity, for experimental purposes, of propagating in living animals a highly infective disease.

VARIETIES OF FOOT-AND-MOUTH DISEASE VIRUS.

Samples or strains of virus derived from animals affected with foot-and-mouth disease are not always similar in their characters. For instance, with viruses from cattle it may or may not be possible to reproduce the disease in other susceptible species by inoculation, *e.g.* in guinea-pigs. On the other hand, strains from cattle which have become thoroughly accustomed or "adapted" to guinea-pigs may produce the disease with difficulty when reinoculated into cattle. Similar instances of adaptation occur in the field where it has been observed that outbreaks of foot-and-mouth disease among swine in some cases do not spread readily to cattle and *vice versa*. It has been found, however, that the differences among strains of virus may be more fundamental in nature and in *Agricultural Research in* 1925 (Ref. 1[1]) it was pointed out that such differences might explain the fact that animals may suffer from the disease more than once within a short time. Up to 1925 two varieties or "types" of virus were known and for certain reasons these were designated types "O" and "A". The difference between these two types can be shown by experiments upon naturally susceptible animals such as cattle, or, even better, on artificially susceptible animals such as guinea-pigs. When the animal is inoculated with virus of the "O" type, it will exhibit after the proper incubation period classical symptoms of the disease. If after complete recovery the animal is reinoculated with an "O" virus no symptoms appear, indicating that an immunity or resistance has developed. If, however, after complete recovery from a first attack due to an "O" virus an animal is inoculated with a virus of the "A" type, symptoms of foot-and-mouth disease are again likely to appear and the animal is then found to be immune to both types of virus. Conversely, it has been shown that animals which have recovered from the effects of an "A" virus are immune to an "A" virus but still susceptible to an "O" virus. With both kinds of virus the symptoms exhibited are indistinguishable, but experimentation on the lines just described has made it clear that the viruses are different from one another.

In 1926 it was found in Germany that there exists in nature a virus of yet another type, which has been called type "C". Thus, animals which have suffered from two successive attacks of the disease consequent upon infection with "O" and "A" viruses are liable to exhibit a third attack if inoculated with type "C" or if placed in contact with animals suffering from the effects of that particular type. Out of the large number of virus strains so far examined, there are few which cannot be placed in one of the three groups, "O", "A" or "C". Now the identification of virus types, and a knowledge of their prevalence and distribution, is important for several reasons. Firstly, it is only by identifying the virus that it can be known whether recovered animals are liable to reinfection from another source; secondly, identification may assist in tracing the origin of outbreaks, and, thirdly, identification is important in relation to the possible use of methods of artificial immunization. For these reasons a considerable amount of work has been carried out on this problem in England, and in all, 40 samples of virus from outbreaks in different parts of the country have been examined by Stockman and Minett (Ref. 11) and by Andrews and his colleagues (Ref. 3[1]) at the Committee's Research Station at Pirbright. Of these, 37 conformed to the "O" type and one to the "A" type, while two were apparently of unrelated and hitherto undescribed types. The experience in England is, therefore, similar to that in other countries in showing that it is the "O" type of virus which predominates. Type "C" is uncommon and so far has only been encountered in Germany and Italy. Andrews has also examined 10 samples of virus from the Argentine, and of these, three were of the "O" type, while six did not belong to any of the three recognized types, since they caused foot-and-mouth disease in animals which had recovered from attacks of all of these types. It was not established, however, that any of these six strains were similar to the two unusual strains encountered in this country.

DISINFECTION IN FOOT-AND-MOUTH DISEASE.

The problem of selecting suitable chemicals for killing the virus of this disease was investigated in the early days of the British Research Committee. Previously, disinfectants known to be effective against ordinary bacteria had been used, but there was no knowledge as to whether they were correspondingly effective against the virus of foot-and-mouth disease. In order to ascertain this, the minimum concentrations in which various chemical substances would destroy the virus within a reasonable time were determined, and the results of this work are given by Minett (Ref. 5). In the first place, experiments were made with the virus as it occurs in the fluid which forms at the site of inoculation in guinea-pigs. When this fluid is diluted with saline, the amount of organic matter is very small, but as a disinfectant is generally required to act in the presence of an excess of dirt and other organic material a second series of dilutions was made under conditions designed to simulate those likely to be encountered in practice. For this purpose, the fluid together with shreds of the overlying skin was mixed with a suspension of cow dung and left for 24 hours at room temperature in order to allow time for penetration of the disinfectants before tests were made for the presence of living virus. As was expected, the value of a number of disinfectants, *e.g.* chlorine, iodine, potassium permanganate and such metallic salts as copper sulphate and zinc chloride, was greatly reduced under these conditions. For example, when the virus fluid was simply diluted with saline, copper sulphate was effective in a dilution of one part in 10,000, whereas in the presence of cow dung a concentration of one part in 100 was required for complete disinfection. Contrary to what is the case with ordinary bacteria, carbolic acid and lysol were found to be relatively inefficient, *e.g.* a two per cent. concentration of carbolic acid was necessary to bring about disinfection within the allotted time of 24 hours. Alkalis were more active than acids, and caustic soda, the alkali tested, was effective at a concentration of one in 800, whereas sulphuric acid was inactive when diluted beyond one in 500. The superiority of alkalis for purposes of disinfection has also been recognized by workers abroad. Thus the German workers, Trautwein and Reppin (Ref. 12), and Olitsky and Boez (Ref. 13) on behalf of the American Commission on Foot-and-Mouth Disease concluded that one per cent. caustic soda would be suitable for use in practice. In the Fourth Progress Report of the Committee (Ref. 3^1) an account is given of further experiments on the use of alkalis for disinfecting objects which are likely to become contaminated during an outbreak. Dobson (Ref. 3^1) in work at Pirbright found that a solution of sodium carbonate or common washing soda is also very effective and is especially suitable since it is in common use for cleansing purposes, is easily procured and is unlikely to damage materials with which it comes in contact. A four per cent. solution of this substance at room temperature practically always killed the virus within 15 minutes, and at a temperature of about 140°F. the virus was destroyed in less than five minutes. Sodium carbonate would, therefore, appear to be a very suitable disinfectant for washing butchers' utensils and for scrubbing tables and floors in slaughter houses, etc.

A good instance of the importance of an alkaline reaction in bringing about the destruction of the virus in nature may be mentioned. It has been pointed out by Wagener at the German Research Station on the Island of Riems that although virus contained in pieces of skin will survive for a long time, even over 100 days in winter, when kept in a sewage tank at ordinary temperature, provided the contents of the tank have not become very acid or alkaline, still the virus is rapidly destroyed in closed tanks into which the cowsheds drain and which contain urine and washings from the stalls. The reason for this is the high content of ammonia and the consequent alkalinity of the liquid. If the effluent from the stalls is freely exposed to the air the virus is not so rapidly destroyed since the ammonia escapes as it is formed.

The disinfection of hay is of special importance owing to the length of time the virus survives upon it under certain conditions. Working with small model haystacks, the surfaces of which had been grossly contaminated with virus, Minett (Ref. 5) found that formalin was a reliable agent for killing the virus. Concentrations of this reagent as low as 1 in 1,000 sprayed on to the hay and allowed to evaporate were efficient, and the conclusion was reached that in practice, uniform spraying with 1 per cent. formalin would be reliable for disinfecting the surface of hay ricks. Subsequent experiments indicated that hay which had been sprayed with 1 per cent. formalin and allowed to dry in the open air could be fed to cattle without harmful effects.

TREATMENT OF FOOT-AND-MOUTH DISEASE.

A number of chemical agents are known to be capable, in very low concentration, of killing the virus when a mixture is made in a tube, and the workers for the Foot-and-Mouth Disease Research Committee have spared no effort in the hope of discovering some chemical compound which would destroy or influence the virus in the living animal. Working at the National Institute for Medical Research, Galloway (Ref. 3[2]) has examined altogether 90 different substances belonging to all classes of drugs which have been found, or have been stated to be, useful in various infections, and still other preparations have been tried by Dobson (Ref. 3[1]). Unfortunately all these efforts have failed, in the sense that not one of the substances has definitely modified the course of the disease in doses which were not seriously poisonous to the animals. Special attention has been given to iodine on account of the results obtained by G. K. Walker and W. Taylor in India in 1926 (Ref. 7). These workers reported that if iodine dissolved in a solution of potassium iodide (in proportion by weight, iodine 1 part, potassium iodide 2 parts, water 300 parts) is injected into the jugular vein of infected cattle at about the time when the animals' temperatures are beginning to rise, the appearance of the typical lesions on the feet and in the mouth can be prevented. Their experiments also showed that treated animals were immune for at least 24 days. If any form of treatment could be relied upon to produce this effect, it would be most valuable because it would prevent the manufacture and diffusion of large quantities of virus and so remove one of the main difficulties with which those who have to deal with foot-and-mouth disease are faced.

In view of the importance of the work of Walker and Taylor, the action of iodine in preventing infection or arresting the progress of the disease has been recently investigated by various workers for the Committee (Refs. 3[1], 5[1]). Treatment was attempted in the first instance on guinea-pigs, the iodine being given in varying doses and in different ways to guinea-pigs at the same time as well as at varying intervals after inoculation with virus. The drug, however, neither inhibited nor delayed the development of lesions. The investigations were then continued upon cattle at the Committee's station at Pirbright. In the first experiment five yearling cattle were inoculated with virus and their temperatures were subsequently recorded every four hours. In all cases the temperatures rose at the thirty-sixth hour, and at this point three of the animals were injected intravenously with iodine solution of the strength recommended by Walker and Taylor and in doses of about 16, 13 and 10 ounces respectively, the remaining two animals serving as controls. The treatment, however, appeared to exercise no influence whatever on the course of the disease. Before carrying out any further trials it was considered desirable to obtain more information as to the amount of iodine which can be tolerated by cattle. As a result it was found that cattle may exhibit comparatively very great tolerance for iodine given intravenously, but that considerable individual variation is shown in this respect. It was clear, however, that one could not safely administer more than 18 to 35 ounces of a solution twice the strength of that used by Walker and Taylor, according to the age and size of the animal.

In a second experiment seven yearling cattle were inoculated with virus, and after the first 24 hours the temperatures were recorded every two hours, because it was intended as before to inject the iodine at the first definite rise of temperature. In six of the animals, however, the characteristic vesicles appeared before there was any significant or definite rise of temperature and the iodine could not therefore be given in the manner prescribed. Forty-eight hours after the virus inoculation the seventh animal was given rather more than a pint of the double strength iodine solution, although at that time its temperature was only 102·6°F. The treatment, however, failed to prevent the development of the disease, as shortly afterwards vesicles appeared on the feet and subsequently in the mouth. In a final experiment five cattle were infected by placing them in contact with two others which had been inoculated with virus. The temperatures were recorded every two hours, but again every animal developed vesicles before there was any significant rise and the treatment could not be applied. The second and third experiments served to emphasise a fundamental weakness of the method as a practical means of combating foot-and-mouth disease. To be of real value, a curative agent should be capable of checking the reaction at an early stage, before the animal becomes infective to others. In order that the iodine should be present in relatively high concentration at a suitable time, it was essential that it should be administered after the onset of fever and before the appearance of vesicles. It has been demonstrated that in practice it is frequently impossible to do this, for vesicles may appear before any rise of temperature can be observed, and they are often seen at the same time as the first rise, or only one or two hours later. Apart from this, however, the experiments on both guinea-pigs and cattle have unfortunately shown that where iodine could be used under the prescribed conditions the drug has no noticeable influence in restraining the development of the disease.

IMMUNIZATION AGAINST FOOT-AND-MOUTH DISEASE.

In the absence of any chemical substance proved to be capable of modifying the course of the disease one is led to enquire as to methods of increasing the resistance of farm animals against infection with which they may chance to come in contact. In the first place, as mentioned earlier, animals which have once passed through an attack of foot-and-mouth disease are immunized or protected against virus belonging to the same type as that which provoked the attack. The fact that more than one type of virus exists serves to explain the divergent views which were at one time held as to the duration of immunity in this disease. Some information as to the duration of this immunity has been obtained in experiments at Pirbright in which a virus of the "O" type was used (Ref. 3[1]). In a special experiment 18 cattle, which after recovery from the disease had been protected from reinfection, were inoculated in the muscles with virus at intervals varying from 13 months to 32 months (in two cases), but none of them showed any sign of declining immunity. It may be said, therefore, that an attack of the disease gives an immunity of considerable duration against virus of the same kind when the virus at the second exposure is introduced into the muscles. Although this is a matter requiring further investigation, there are fairly good reasons for assuming that the animals would have resisted for the same length of time natural infection by contact.

Several methods are available for producing immunity artificially: (*a*) Inoculation with rather large doses of blood serum from previously immunized cattle, *e.g.* in doses of 4 ounces for an animal weighing 6 cwt., gives cattle and other animals a considerable measure of protection for about ten days. In France and other countries the serum from convalescent animals which have simply had an attack of the disease due to the virus prevalent at the time is often used. In Germany the serum is taken from animals which after recovery have been given repeated injections of virus of the three recognised types, with the object of increasing its potency and rendering it effective against virus of any of these types.

Serum treatment is now being adopted in Great Britain as an experimental measure for the purpose of limiting the spread of the disease among animals living in close proximity to infected premises. On infected premises themselves the slaughter of all affected and contact animals continues to be the basis of existing policy. In 1931 serum was used in 5,450 animals at 22 centres of the disease, and in two cases only did symptoms appear after treatment. In 1932 serum was used in connexion with 11 outbreaks and administered to 2,642 animals, including 2,291 sheep and 229 cattle. The disease developed in only four animals, and in two of these it was probable that infection was acquired before serum was injected.

(*b*) A second method is to inject the animals with a potent serum and with virus at the same time, the idea being that the serum will diminish the severity of the attack without preventing it altogether and so leave the animal with a lasting immunity. By this method the severity of the attack, though variable, is seldom serious, although the amount of immunity is said to be proportionate to the degree of illness produced. Unfortunately, during this slight illness the animal is infective to others. By this means all the animals at the scene of an outbreak are made to pass through the disease rapidly, but in some cases owing to the action of the serum the eruption of vesicles is unusually late, and for this reason, in Prussia, where the system is widely practised, the period of quarantine for animals under immunization has lately been slightly extended up to about five weeks. Since cattle undergoing this treatment are for a time infective to others, all cattle in the immediate neighbourhood are given a protective dose of serum in order to prevent their becoming infected and so spreading the disease. This procedure is considered in Prussia to give very valuable results, but for various reasons the spread of infection and occurrence of further outbreaks is not always prevented. (*c*) In 1926 Vallée, Carré and Rinjard (Ref. 8) in France showed that a certain degree of immunity could be produced in cattle by means of a vaccine composed of virus which had been killed by formalin. Independently of the French researches, Bedson, Maitland and Burbury, at the Lister Institute, reported in 1927 (Ref. 4^1) that virus treated with formalin was capable of producing in guinea-pigs a substantial measure of protection. An experiment at Pirbright in 1926 (Ref. 4) confirmed the fact that the resistance of cattle also could be increased by virus killed by formalin. Vallée in 1930 (Ref. 9) stated that in France over 600 doses of vaccine made in various ways had been used, and at the same time he recorded properly controlled experiments with several groups of cattle in which a vaccine appeared to protect animals against the disease. Schomorokhoff (Ref. 10) also reported in 1930 encouraging results from the use of formalinized vaccine in 27 cattle tested by inoculation and 24 by exposure to infection from diseased animals, but the exact method of preparing the vaccine was not given.

It is most desirable that further properly conducted experiments on a sufficiently large scale should be carried out to determine the real value of formalinized vaccine in foot-and-mouth disease. One of the chief difficulties at present is to secure virus in sufficient quantity for the preparation of the vaccine and in this connexion, as pointed out above, a practical method of cultivating the virus artificially would be of great value. At present, virus produced for the purpose in living animals would have to be used; in these the virus exists in greatest concentration in the lesions, which, however, are always limited in extent. Another possible source would be the blood, but the amount of virus in the blood is very variable and is not large. Nevertheless, under existing conditions the blood serum of infected cattle would appear to be the most suitable source of virus and to this might be added virus collected from the lesions. In any case, it would be important that the vaccine should be prepared by an exact method and that it should be thoroughly tested both for loss of infectivity and for its immunizing power in guinea-pigs before it is used on cattle.

II.—SWINE INFLUENZA.

The term "swine influenza" is applied to an infectious disease of swine the symptoms of which show a remarkable resemblance to influenza in human beings. Each year, and especially in the autumn and early winter, the disease occurs in that part of the United States known as the "hog and corn belt", in the form of outbreaks which involve practically every pig in numbers of herds. In America the disease was first recognized in 1918, and it is likely that special attention was called to it because in that year an extensive epidemic of influenza was raging among the human population. The disease is popularly known as "hog 'flu", though actually this term covers conditions which resemble in some, but not in all, respects the disease which is the subject of this article. Enquiries have failed to show that swine influenza occurs in Great Britain, and it appears to be unrecognized anywhere outside the United States and Canada. It is highly probable that the disease is really non-existent in other countries because the symptoms could scarcely have failed to attract attention, and in any case owners would certainly have reported it under the swine-fever regulations.

Just as in human influenza, swine influenza has a sudden onset, with fever, prostration, extreme muscular weakness, and sometimes paroxysms of coughing. As a rule, however, after two to six days, during which the pigs appear to be extremely ill and refuse all food, recovery takes place almost as rapidly as the disease sets in. On an average not more than 1 to 4 per cent. of pigs die, the deaths being caused by a certain kind of pneumonia.

The nature of this disease and interesting facts regarding its causation have recently been worked out by Shope (Ref. 14), of the Rockefeller Institute, New York, who in the autumn of 1928 and of 1929 investigated two extensive outbreaks in Iowa.

The outbreak in 1928 was particularly severe, and in some herds the losses by death reached 10 per cent., while in 1929 the outbreak was extremely mild and the deaths on an average were less than 1 per cent.

With the object of demonstrating the nature of the disease, material from swine in the Iowa outbreak was brought to the Rockefeller Institute and used in experiments on swine raised in a district where at that time the disease did not exist. The selection of swine for the work was an important matter because there was good reason to believe that animals which had once had the disease were resistant to further attacks and such animals would therefore be unsuitable for experiment. Also, as the disease is extremely infectious, special precautions had to be taken to isolate the pigs before and during experiment. With susceptible swine it was found to be a simple matter to transmit the disease by injecting into the nasal cavity small quantities of fluid from the bronchial tubes of diseased swine. The material used for this purpose was sometimes highly potent, quantities as small as 20 drops at times sufficing to produce severe influenza, although much of the material introduced was immediately expelled by sneezing. Similar material from normal swine had no effect. Moreover, it was easily demonstrated by experiment that the disease was caused by some infective agent because it could be transmitted from pig to pig in series by instilling bronchial discharge into their nostrils. The disease thus set up artificially closely resembled the natural disease, although it was often more severe, and it was also proved that the artificial disease was infectious to healthy swine kept in the same pen, symptoms appearing two to seven days after exposure.

In view of these successful transmission experiments the problem then resolved itself into finding the nature of the infective agent. For this purpose a bacteriological examination of naturally and artificially infected swine was carried out in the first place, with the interesting result that from the respiratory organs bacteria were grown which were indistinguishable in microscopical appearance and in cultural properties from bacteria which are frequently associated with influenza in human beings. Since such bacteria could not be cultivated from normal swine, it was immediately suggested that these organisms were the cause of the disease. The next step, therefore, was to see whether cultures of these organisms grown on artificial media would set up the disease when inoculated into susceptible pigs. Several attempts in this direction, however, proved that influenza bacteria are not capable of inducing swine influenza, although in certain conditions they may produce disease in swine. The rapidly-spreading character of the natural infection suggested the possibility that a virus of the filterable class, similar to that of swine fever, for example, was responsible. In exploring this possibility, pieces of lung, thoracic lymph glands and bronchial fluid were ground up with sterile water or broth, and after the more solid portions had been removed from the mixture as far as possible by centrifugal force the liquid was passed through a porcelain filter capable of removing microscopically visible bacteria. The clear filtrate thus obtained was then injected into the nostrils of susceptible swine, and in seven out of ten preliminary experiments, after two or three days' careful observation it was perceived that some of the inoculated pigs were ill. As, however, there was usually no fever and the symptoms were extremely mild, it was evident that this illness could not rightly be called swine influenza. Nevertheless, the experiments indicated that the filtrate did contain some infective agent and this was made certain by the observations that the mild illness thus set up by injecting filtrate could be transmitted through a series of pigs by means of filtrate and that the same mild disease was highly infectious to healthy pigs placed in the same pens. Influenza bacteria could not be grown from pigs which were suffering from this mild filtrate disease, and in this respect the animals were not different from healthy swine.

Since the only constant difference bacteriologically between the mild filtrate disease and typical spontaneous or experimental swine influenza lay in the absence of influenza bacteria in the filtrate-infected swine, Shope decided to see whether a combination of the bacteria and the filterable agent was essential for the production of the natural disease. To this end five experiments were conducted on 24 pigs, and in order to make the results more decisive the pigs in the individual experiments were taken from the same source and in most instances from the same litter. All the experiments followed much the same lines and the material was injected intranasally by means of a syringe. In each instance one or two pigs were injected with filtered material from pigs with influenza, prepared as described above; one received culture of influenza bacteria, one or two were injected with a portion of the same filtrate mixed with a portion of the same bacterial culture, while one animal serving as a control was injected with the unfiltered material. The results were quite conclusive and showed that in order to set up typical swine influenza it was necessary to inoculate either unfiltered material or filtrate and culture together. The severity of the disease varied from one experiment to another, but in two cases the attack was more severe with the filtrate and culture than in the control pigs.

Again it was shown that the culture alone was harmless and that the pigs which received filtrate suffered from an extremely mild illness. Finally, it was established that healthy pigs placed in contact with those injected with filtrate and culture developed typical influenza.

The exact reason why the combined action of two agents is necessary for producing the typical symptoms of the disease is uncertain, but the most probable explanation is that the filterable virus lowers the resistance of the body and enables the influenza organism, which in the ordinary way is harmless, to invade the tissues and cause effects which it is quite impotent to achieve alone. The curious fact is that this organism is apparently the only one which is able to exert this effect in the presence of the virus. It is also curious that another virus of pigs, *viz.*, that of swine fever, which on a number of grounds was shown to be quite distinct from that of swine influenza, does not permit the influenza organism to multiply and cause disease when the two are mixed together and injected into the nostrils. When this experiment is done the result is an attack of swine fever and the presence of the 'flu organism has no effect upon the symptoms which are quite different from those of swine influenza.

In the earlier part of the work dealing with the causation of the disease it had been shown that animals which had passed through one attack of the experimentally induced disease, could not be reinfected by contact with pigs in the acute stages. In addition, such recovered animals were often protected against what is perhaps a more severe test, *viz.*, insertion of infectious material directly into the nasal cavity. When the reason for this state of induced resistance was being sought it was found that the blood serum of a recovered pig when mixed with material from a case of disease was capable of neutralizing its infective properties, whereas the serum of a normal pig had no such effect.

Further investigations (Ref. 14[1]) showed that pigs injected with cultures of the influenza bacterium not only showed no symptoms, but also were still quite susceptible to influenza. On the other hand, animals which had recovered from the mild disease caused by intranasal injections of the filtered virus were immune to swine influenza. These two pieces of evidence are again in favour of the view that the filterable virus is of primary importance, while the organism merely exerts a secondary and contributory rôle in the natural disease.

Shope then investigated the possibility of immunizing swine against influenza without producing any illness at all in the process. This led to the discovery that if the filterable virus is injected into the muscles no symptoms of any kind appear and this was so even when the respiratory tracts of some of the experimental animals were artificially infected with influenza bacteria. This then was a proof that the virus was harmless except when it was injected directly into the respiratory tract. Moreover, it was especially encouraging to find that such animals were immune to intranasal injections of mixed virus and bacteria which in healthy swine set up swine influenza. It is to be hoped that further work on a larger scale will show that this method or one equally efficient can be safely used in practice for immunizing swine against the natural disease.

The idea that filterable viruses and bacteria may act in concert is not quite novel, though the present instance is a particularly striking one. The work which has been briefly described above is also of interest in another connexion. The symptoms and certain of the pathological features of swine influenza are remarkably similar to those of influenza in human beings. Future research may show still further analogies, but in any case the instance clearly illustrates the value which research on animal disease may have in solving the problems of disease in man.

III.—CONTAGIOUS ABORTION IN CATTLE.

INFLUENCE OF NUTRITION UPON SUSCEPTIBILITY.

It is known that serious reproductive disturbances leading to the premature birth of calves can be produced in cattle by feeding them on diets which are markedly deficient in nutritional factors, *e.g.* calcium, phosphorus and possibly certain vitamins. It is also known that fairly heavy milking cows in the early part of their lactations draw upon their skeleton for a considerable part of the lime needed for milk production and this is especially noticeable when the rations are low in lime. As the milk flow diminishes, this draft becomes less, and towards the end of lactation and in the dry period extensive storage of minerals again takes place in the skeleton. In view of these facts, the feeding of mineral supplements, particularly lime and phosphorus, has been recommended for milking cows, and it has even been claimed that the feeding of minerals will prevent abortion. Now that abortion in cattle is recognized in the majority of cases to be a symptom of a contagious disease, the question has been debated for some time whether the disease is more likely to occur in cattle on a ration deficient in minerals and low in protein than in cattle on a complete ration, *i.e.* one which meets all the requirements of the animals. This is the same thing as asking whether a ration low in lime and protein can so lower the resistance of cattle that they become more susceptible to contagious abortion. This was the problem which in 1926 the College of Agriculture of the University of Wisconsin, through a fund of 40,000 dollars provided by the Wisconsin Manufacturers' Association, decided to investigate. For this purpose in September, 1926, a herd of 44 Holstein heifers, ranging in age from six to eight months, was assembled. The experiment lasted for five years. The progress of the investigations to November, 1929, is described by Hadley and Hawn (Ref. 15), while the results up to September, 1931, are given by Hart, Hadley and Humphrey (Ref. 16).

In order to eliminate the chance that any of the animals were endowed with an inherited or acquired immunity, they were derived from herds all the animals of which were negative to the blood agglutination test for abortion. The same bull was used throughout the experiment. The heifers were divided equally, according to weight and herd origin, into two lots. Lot 1 received a "good" ration, consisting of alfalfa, corn silage and a grain mixture containing corn, oats, oil meal, bone meal, wheat bran and cod-liver oil. The last item was added to furnish vitamin D which is believed to promote the utilization of both lime and phosphorus. Iodised salt was given to prevent the possibility of goitre. In the summer they had alfalfa and sweet clover pasture. This diet provided plenty of lime and other necessary minerals, as well as adequate protein and vitamins. Lot 2 received a relatively poor ration, consisting of corn silage, timothy hay from acid soils, and a grain mixture of corn and oats, fortified with gluten meal. The only addition to the mineral content of this ration was a little common salt. In the summer they were pastured on timothy grass. The authors affirm that this ration was decidedly deficient in lime for milking cows, especially during the winter, only fair in its phosphorus content, and somewhat low in protein. The poor ration was selected since it is one not uncommonly used on farms in the more northerly parts of the United States. A much poorer ration could have been given but the authors avoided this because it would have profoundly disturbed the animals' nutrition and would not, therefore, have simulated natural conditions. Details as to the quantities of the different rations and information regarding analyses are given in the original article. The water supply for both lots came from the same well.

During the first year both lots showed approximately equal increase in weight. Eventually all were served and calved to time, and only one retained the afterbirth. The average weight of the calves from the two lots was practically the same and all of them thrived normally. After the heifers had been in milk for about three months, they were again served and about 76 days later, when all were found to be pregnant, they were divided into five groups, each group containing approximately the same number of animals from each lot. Four of the groups were then exposed to abortion infection and the other was left as a control. The object of this exposure was to determine whether either ration had conferred any protection against, or lowered the resistance to, abortion infection. The results of the experiment so far as the termination of pregnancy is concerned are shown in Table I.

TABLE I.

Group.	Number of Animals.	Ration.	Calved normally.	Aborted.	Days between exposure and abortion.
1	6	good	0	6	90 (average)
	6	poor	2	4	177 (average)
2	4	good	2	2	138, 170
	4	poor	2	2	130, 161
3	3	good	2	1	127
	2	poor	1	1	242
4	3	good	1	2	190, 249
	3	poor	3	0	—
5	2	good	2	0	—
	4	poor	3	1	135

The method of exposure to infection in the first four groups was similar in that all the animals were fed with material containing the abortion bacillus, though the amount administered was different. Groups 1 and 2 were fed with a mixture consisting of the stomach contents of several aborted calves, material which is known to be rich in the organism, and a few days later with artificial cultures. In addition, they were exposed to cows which had recently aborted. With Groups 3 and 4 the dose was greatly reduced and consisted of a single feeding with stomach contents from one aborted calf, and they were not exposed to natural infection. The animals in Group 5 were not fed, but were exposed to natural contact with cows which had aborted, including animals belonging to Groups 1 to 4.

This Table shows that, omitting the cows in the control group, which are not strictly comparable, of 16 cows on the good ration 11 aborted and of 15 cows on the poor ration seven aborted. With both rations, however, judging by the result of the blood agglutination test, quite a number of those which calved normally were actually infected, including all those in the control group. Nine of the well-fed cows retained their afterbirth as compared with three of those on the poor ration, but the reason for this difference was not apparent. Seven of the original forty-four animals were not present throughout the experiment; of these, five were discarded for reasons not connected with the experiment, and one from each lot was rejected on account of sterility after the first calf. Apart from this, the herd remained practically free from all disease, except that which was the subject of experiment. The comparative breeding efficiency in the two lots was compared by means of the formula that one calf every 12 months is equivalent to 100 per cent. efficiency. According to this, the breeding efficiencies were as follows: Lot 1, first pregnancy 85 per cent.; second pregnancy 48 per cent. Lot 2, first pregnancy 80 per cent.; second pregnancy 67 per cent. In other words, those fed on the good ration had a slightly higher breeding efficiency than those on the poor ration before exposure to infection and a somewhat lower efficiency afterwards.

Table II shows the live weights, milk and fat yield and the fat percentage for the two groups during the period October 1926 to December 31st, 1928.

TABLE II.

Ration.	Number of Animals.	Average live weight in lbs.		Average daily yield of milk and fat in lbs. per cow.		Fat percentage.
		Initial.	Final.	Milk.	Fat.	
Good	19	475	1077	29.53	.901	3.05
Poor	20	493	1115	26.27	.902	3.43

In connexion with Table II it is pointed out that the two rations were adequate for normal growth, the net increase in live weight of the animals in the two groups being very similar, though slightly in favour of those getting the good ration. In appearance the cows were much the same, and experienced men visiting the herd usually failed to distinguish those getting the different rations. The well-fed animals produced on an average more milk than those less well-fed, though actually in the second lactation the milk yield of the latter group was higher because there were relatively fewer abortions than in the well-fed lot. The depression in yield and percentage of fat was undoubtedly due to the feeding of cod-liver oil.

It was clear, therefore, from this experiment that the good ration did not increase resistance to contagious abortion, nor did the poor ration increase susceptibility. There is, therefore, no evidence that resistance to contagious abortion can be increased, or the ravages of the disease reduced by building up the mineral or other nutritional reserves of the cow. Incidentally, it should be pointed out that this experiment was merely intended to test a hypothesis and not as an argument against good feeding. The experiment was also held to justify several other important conclusions. Thus, cows have the ability to adapt themselves to a much lower lime intake than has been thought possible, and the efficiency of lime utilization appears to increase as the level of lime in the ration decreases. The experiment does not support the contention that extra amounts of protein are definitely stimulating to greater milk production. From the disease point of view two facts are to be noted. Firstly, the bull used in this badly infected herd did not acquire the disease. Secondly, a surprisingly large proportion (88 per cent.) of 33 cows which reacted to the blood tests eventually became non-reactors. This was considered to show that they had recovered from the disease, but it ought to be remarked that the conditions were not similar to those of ordinary practice in that this herd was kept isolated, no additions were made to it and no calves were reared.

SURVIVAL OF ABORTION BACTERIA OUTSIDE THE BODY.

Cows which have aborted continue to give off infective discharges from the genital tract for two or three weeks, rarely longer, and such animals if not isolated during this period are capable of infecting sheds or pastures. A point which comes up for consideration, therefore, is the length of time the organism is able to survive when it leaves the body of the infected animal. The question assumes a practical shape when, for example, an opinion is sought as to the length of time pastures on which animals have aborted ought to be left vacant before other cattle are moved in. Unfortunately, it must be said at the outset that it is not possible to give a categorical answer to this enquiry because the duration of infectivity is bound to be determined to some extent by variable factors, such as the temperature and humidity of the atmosphere and the amount of sunshine, while such factors as the rainfall and the extent to which the material is protected from desiccation and sunlight will also affect the issue. All that can be done, therefore, is to refer to such information as is available, in order that some judgement may be formed as to probabilities. In the first place, it should be said that the abortion organism is a delicate one when compared with some other bacteria, *e.g.* those of anthrax in the so-called spore stage or the bacteria of tuberculosis. For instance, it is known that anthrax spores may live under certain conditions for as long as 20 years and that tubercle bacilli may survive in stored cow manure for at least two years (Ref. 17; Stenhouse Williams and Hoy, 1930). There is no evidence that the organism of contagious abortion is capable of surviving outside the body for periods such as this.

Among the first to investigate this question were McFadyean and Stockman in their work for the Departmental Committee on Contagious Abortion (Ref. 18). If an infected pregnant animal is killed at the stage when the disease is fairly advanced and the uterus is opened, there is found between the membranes surrounding the foetus a fluid of tenacious consistency which contains abortion bacteria in large numbers. On one occasion when some of the fluid from such a case was mixed with sterile broth in a tube and stored in the laboratory, McFadyean and Stockman found that the organisms were alive about seven months later. At this time cultures of the abortion organism could still be obtained from it, and in fact these cultures were used experimentally for setting up abortion in a pregnant heifer. In a second experiment natural material was stored under similar conditions for nearly six months and a culture which was then obtained from it was used for infecting a pregnant heifer. On another occasion a large dose of the uterine fluid itself, after 12 months' storage in a tube in a cool room, was used for inoculating a pregnant heifer, but in this instance the result was negative. Similar conclusions have been reached by other workers, and it is clear that under artificial conditions when the material is not allowed to dry up or go putrid in the ordinary sense, abortion bacteria are capable of surviving for at least six months. On the other hand, it does not follow that the organism will remain alive as long as this under natural conditions outside the body, and an experiment by McFadyean and Stockman showed that it is killed when infective material is completely desiccated.

In recent work at the Kentucky Agricultural Experiment Station (Ref. 19), where suspensions of abortion bacteria from artificial cultures were sprayed on to pasture, the organisms could not be recovered for longer than five or six days in February and November, or for more than one day in May when the weather was sunny. In some experiments carried out in the United States by Schroeder and Cotton (Ref. 20) uterine fluid was spread on pasture during the month of February when the weather was rather warm for the time of year. The material dried into a leathery mass and from it living abortion organisms could be recovered for 10 days only. On the other hand, abortion bacteria have sometimes been found to live for much longer periods, thus Schroeder and Cotton found that abortion bacteria might survive up to 135 days, the date at the end of this period of exposure being the 5th of May. In this case the material consisted of afterbirth and organs from an aborted foetus, and it was protected from exposure by being placed under some dried leaves in a wood. In a later publication, however, these authors express the opinion that the long survival in this instance was exceptional. In 1926 Mathews in the United States (Ref. 21) related observations dealing with the same subject. Ten aborted foetuses and their corresponding afterbirths were minced up and the material then divided into 10 lots and allowed to dry in thin layers on glass plates in a cool room. For certain reasons the results are only available for five of these lots. After varying periods the material was examined by inoculating guinea-pigs, with the result that after three months every lot was infective; after four months, two of the five lots were still infective and after five months the whole of the material was dead. In an experiment carried out in the same way with foetuses and membranes from an aborting sow the material was non-infective to pregnant swine by feeding after 6 weeks. In connexion with these experiments it should be mentioned that the guinea-pig is very susceptible to abortion bacteria and that a very small number of organisms suffices to infect. It does not follow that the material even at the end of three months would certainly have produced abortion in a pregnant cow.

While it is true that more information bearing on the subject would be valuable, the evidence on the whole strongly conflicts with the view that the organism is capable of surviving for more than three months under natural conditions outside the body, and the indications are that in many cases its life is much shorter than this. In any case, if an animal is thought to have aborted on pasture, early efforts should be made to find the foetus and its membranes. These would then be destroyed and the spot where they were found covered with quicklime. If a broad view of the matter is taken there appears to be no reason why a contaminated pasture should be left vacant for longer than three months at the outside, and it would be safe to use such a pasture for young or non-pregnant stock much earlier than this.

METHOD OF INFECTION IN CONTAGIOUS ABORTION.

For practical purposes contagious abortion is a disease of the reproductive system and when the nature and cause of the disease were first discovered it was believed with some reason that infection entered by the most direct route, *viz.*, by the vaginal canal. In accordance with this view, the disease was considered to be transmitted through the agency of the bull or by infective discharges gaining entrance to the genital passages when the cow was recumbent. At the present time this is not generally accepted as the true explanation, and on very good evidence it is now recognized that healthy cows become infected by way of the mouth, *e.g.* by licking recently aborted animals, by consuming aborted foetuses, or food or water contaminated with discharges from aborted cows. In passing, however, it may be mentioned that when infective matter is taken in by the mouth it is not essential for it to pass into the stomach and intestines before setting up infection. Much of it may remain on the lining membrane of the throat, and from that situation it may gain direct access to the tissues.

Within the last few years the question has been considered whether in nature, bacteria may not sometimes enter the body through other channels, *viz.* through some part of the skin, or through the eye, or to be more precise through the conjunctiva, *i.e.* the membrane lining of the eyelids. It is known that this may happen in the case of tubercle bacilli, and in experiments with abortion bacteria which are summarized below, it has been shown quite definitely both with small laboratory animals and with cattle that infection can take place by both eye and skin routes. Whether such methods are of importance in practice would not be easy to determine, but it is not unreasonable to suppose that drops of infective material might be splashed into the eyes of animals or that infection might be carried on particles of dust or by flies that congregate about the eyes. Similarly, in the case of the skin, it can easily be imagined that infective material might be smeared on the coat whence its entrance into the body might be facilitated by the existence of small abrasions.

Infection through the Eye. It was shown by Schroeder and Cotton (Ref. 22) at the Experiment Station of the United States Bureau of Animal Industry that abortion organisms can infect animals through the conjunctiva. Guinea-pigs were used in the first instance, groups of 6 or 12 animals being treated in the eye or in the mouth or for purposes of control, beneath the skin, while another group left untreated was confined in cages with the eye-exposed guinea-pigs. The same small dose of organisms, derived for half the animals from an aborted cow and for the other half from an aborted sow, was used for the guinea-pigs treated by the eye and by the mouth, viz. one drop of a suspension prepared from an artificial culture of the organism. The results showed clearly that guinea-pigs are more susceptible to abortion infection by the eye than by the mouth, since with the cattle organisms 4 out of 12 guinea-pigs were infected by the eye and 0 out of 12 by the mouth. Four out of 6 were infected when the organisms were injected beneath the skin, while none of the animals in contact with the eye-exposed guinea-pigs became infected. With the abortion bacteria from swine, infection was much more severe, since all 12 guinea-pigs treated through the eye were infected, and the same was true of the 6 guinea-pigs injected subcutaneously. Seven out of the 12 guinea-pigs were infected by dropping the bacteria into the mouth, and 7 out of 12 confined in the same cage with the eye-treated animals also became infected.

Experiments were then carried out with cattle (Ref. 23). A healthy pregnant heifer was selected and one drop of a suspension of abortion bacteria was allowed to fall on one of her eyes. Two hours later the animal, together with an untreated pregnant heifer, was placed in a clean pen. Thirty-six days after infection, the treated heifer first became positive to the blood test for abortion, and after 54 days she gave premature birth to a dead calf. It was proved by tests on guinea-pigs that this sequel was really due to the abortion organism, and it was also ascertained that one quarter of her udder had become infected. The untreated heifer calved normally and tests of her blood gave no indication of infection. In a recent article, Cotton and Buck (Ref. 24) state that susceptible pregnant cattle can be readily infected through the conjunctiva with amounts of material surprisingly small compared with those required by ingestion. So far the method has proved successful in 16 or 17 trials in cattle and failures are in fact so rare that the method has proved to be of far greater value in experimental work than the introduction of material by the mouth as formerly.

Infection by the Skin. The possibility that abortion bacteria may pass through the skin was first demonstrated by Hardy, Hudson and Jordan (Ref. 25), using guinea-pigs. These were arranged in four groups, each containing 20 to 28 animals, and treated as follows: with Group 1 a portion of the abdominal surface was shaved and the skin abraded; Group 2 was treated in the same way except that the skin was not abraded, while in Group 3 the hair was simply clipped. Abortion bacteria were then gently rubbed on the prepared areas and allowed to dry. With the fourth group for purposes of comparison a small amount of the same material was dropped into the mouth. Taking the four groups in order, the percentages of successful infection were 100, 90, 78 and 22. It is evident, therefore, that infection is readily conveyed through the skin, even when all possibility of direct injury is excluded; by the mouth, infection failed to occur in more than three-fourths of the animals.

Experiments on similar lines with cattle have since been reported by Cotton and Buck (Ref. 24). They showed that abortion organisms were capable of passing through the injured skin of cattle, and also, though somewhat less uniformly, through the unbroken skin. In one experiment, four out of seven susceptible pregnant heifers were infected through the unbroken skin. Two other pregnant heifers which were similarly treated, except that the areas of skin were scraped after shaving, also became infected. In each animal an area of skin about 6 inches square over the hip muscles was shaved, and after bacterial suspension had been gently applied, the spot was covered with a cloth which was held in place for several weeks by adhesive tape. All necessary precautions were taken to ensure that the protecting cloth could not be disturbed by the animals themselves, hence it could be safely concluded that infection really entered through the areas of skin treated.

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FARM ECONOMICS.

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I.—Policy and Organization.

1. *Introduction.*

It may well be that the year 1932 will stand out in agricultural history, along with the year 1846 which witnessed the repeal of the Corn Laws and the year 1879 which heralded the great agricultural depression of last century, as one of the turning points in the fortunes of the British farming industry, for better or worse. For more than eighty years past the national policy has been to promote the unrestricted exchange of British manufactures with the agricultural products of all the world, and its effect on the development of home agriculture is now a matter of history. From being a community, at the middle of last century, largely self-sufficing in its food requirements, Britain tended more and more thereafter towards specialization in its agriculture on the perishable products of farming. Wheat growing, first of all, was gradually reduced until the home supply represented no more than about 20 per cent. of the country's requirements. Ploughland gave place to grass, farmers came to rely more and more on the live-stock industry, and there were great developments in dairying. Again, the potato and market-gardening industries and fruit-growing expanded steadily, particularly in the more recent years.

But Britain enjoyed no monopoly in the supply of such products. The wholesale invasion of our market by prairie-grown wheat was followed at a later date, when the science of cold storage had made headway, by the import on an increasing scale, first of frozen and later of chilled meat, while the Continental farmer organized his farming more and more to cater for the British market for fresh food, such as pork and veal, dairy products and vegetables. But for a long time the increase of population and the advance in the standard of living consequent on industrial prosperity sufficed to absorb the increasing supplies from external sources without imposing any serious check on the development of the new systems of farming evolved in this country after the decline of corn-growing. In short, British farming had recovered its balance after the shocks of the 'eighties and 'nineties of last century, though not without difficulty in a market open to all the world, and it could keep it so long as the exchange of commodities in the international market suffered no decline.

In the last year or two, however, an unprecedented situation has developed, for one of the economic consequences of the war is that international trade has broken down, while production from the land has continued unabated and even stimulated by all the resources of modern science and invention. Britain, during this time, has offered the only free market for the surplus production of all the world, and the flow of agricultural products to this country has been maintained, and even increased, notwithstanding the steady decline in the country's counterbalancing export trade. There has been a general and progressive fall in commodity prices, which in some things, such as wheat and wool, has not stopped until they were below pre-war values, while farmers, not infrequently, have found themselves unable to sell certain forms of produce at any price, owing to the excess of supplies.

This is the situation which the Government has had to meet, and the steps which have been taken and those which are contemplated are of the first importance to farmers, not so much from any influence which they may have had, as yet, on prices, as from the prospect which they offer of possible readjustments of farming systems to take advantage of them in the future.

2. *State Action.*

The policy of free importation of food which has now been abandoned after three generations, has been replaced by a policy of protection of home agriculture which takes three forms—(*a*) subsidies, (*b*) tariffs, (*c*) restriction of imports.

(*a*) *Subsidies.* So far, the principle of the subsidy has been applied only to wheat, and the method differs from the subsidy granted nine years ago to home-grown sugar in that it is paid not from the national Exchequer but by the consumer. As every farmer knows, the millers have to take the home-grown wheat crop up to a maximum of 27,000,000 cwt. for a fixed price, without regard to the world price if that is lower (Ref. 1). Here was obviously a good thing, and just as farmers had been quick to take advantage of the profit offering to growers of sugar beet for a subsidized sugar industry, so they have varied their cropping to the farthest possible limit to secure the profit held out to them with wheat at 45*s.* For the harvest of 1932, 90,000 additional acres were sown to wheat, most of it, no doubt, in anticipation of the Act, and the autumn and spring sowings for the harvest of 1933 show a further increase of 372,000 acres.

It is here that a word of warning is needed. The acreage under crop for the 1933 harvest promises to yield the maximum for which the growers can receive the full price of 45*s.*, and any further extension of acreage resulting in a saleable crop of more than 27,000,000 cwt. will reduce the price payable to them proportionately. No farmer, therefore, who doubts the capacity of his farm to grow wheat for less than 45*s.* per quarter should extend his acreage under this crop next autumn, for the price which will be paid to growers for the harvest of 1934 may very well fall below the maximum figure named in the Wheat Act.

(*b*) *Tariffs.* The imposition of import duties on foreign products, mainly horticultural, opened up possibilities of which farmers are already availing themselves (Ref. 2). Competition in horticultural products is from Continental rather than Empire growers if hard fruits be excepted, and the farmers' nominal advantage from tariffs is not whittled away by Empire preference, as is happening with certain meat and dairy products. As an example it may be recalled that three summers ago, growers were leaving black-currants unpicked and even grubbing their plantations; under the new conditions, the crop is once more remunerative. There should be opportunities to farmers where soil, climate and economic factors such as labour, transport, markets, etc., are favourable, to develop the production of some of the fruit and vegetable crops the prices of which have benefited by the new national policy. Changes in the public taste have created a demand for a lighter and more varied diet amongst all classes, and there can be no doubt that a greatly increased consumption of fresh fruit and vegetables would follow the return of industrial prosperity, and farmers should be prepared to meet it.

It is to be regretted that the same advice cannot be extended to potato growers. Import duties have failed, hitherto, to maintain the price of a commodity which is being produced in quantities in excess of public demand.

(*c*) *Restriction of Imports.* Experience of tariffs gained in the short time of their existence has made it abundantly clear, to fiscal reformers and to farmers alike, that their effectiveness has certain limitations when applied with the reservations that are inevitable for Britain, and without international agreement on monetary policy. For Britain must give a preference in any tariff policy to Empire products, and a foreign country prejudiced by the imposition of tariffs on its products can do much to neutralize the disadvantage by manipulation of its currency. To meet these difficulties, the Government decided to proceed to regulate the quantity of certain imports by arrangements with those countries supplying the home market. At the time of writing, however, farmers cannot be encouraged to develop any particular branch of their business as a consequence of the regulation of imports. Restrictions of imports from the Empire could only be secured by voluntary agreement, and these have proved ineffective hitherto, while the beneficial results which might have followed on such restrictions as have been imposed upon foreign suppliers have been more than neutralized by the prevailing economic depression. But one event of the year 1932 (and in this connexion its consequences in 1933 must also be recorded) encourages the hope that in some directions control of imports may shortly be effective, and this is the work of the Pig Reorganization Commission (Ref. 3). It is probable that before these words are printed, pig producers will have accepted the scheme, based upon the Report of the Commission, under which quantitative regulation of bacon imports, regulated by the supplies for which farmers may have contracted each year with the bacon factories, will be in operation. Under the proposed scheme (Ref. 4), the contract price which any farmer will receive for bacon pigs is to be based upon the price of feeding-stuffs. It is unlikely that the margin will be a large one, after all the risks of pig production and feeding have been discounted, but given reasonable efficiency in the selection of breeding-stock and in the rationing of baconers, farmers may be advised to contract with their factories to the full extent of their capacity, in the certainty that they will have a working profit. If these anticipations are realized, there is no reason why the British farmer should not develop the home bacon industry far beyond anything that has been contemplated in the past.

It is much more difficult to estimate what effect the bacon scheme will have on the pork market. Up to date, there has been no proposal for any regulation of the trade in fresh pork. The opinion is held by some that as the farmer who has contracted with a bacon factory must fill his contract under penalty and so will be unable to seek an alternative sale on the fresh pork market if prices there are more favourable, the pork trade should become steadier and less liable to the violent fluctuations which have always characterized it. On the other hand, whereas the contracting farmer can only sell to the bacon factory, there appears to be nothing in the bacon scheme to prevent the factory unloading pigs on the fresh pork market, and if this be so, this market must continue to be the gamble which it has so often been in the past.

3. *The Milk Reorganization Commission.*

This summary of the economics of agriculture as they affect the farmer in the management of his business, deals nominally with the events and publications of 1932. But things are moving very fast in agricultural organization to-day, and some reference must be made to a publication so important to tens of thousands of farmers as the Report of the Commission, set up in 1932, to consider the marketing of milk (Ref. 5), and of the scheme which was the result of it (Ref. 6). There should be no need to elaborate the scheme here, for its details have had a wide publicity at the instance of the Minister of Agriculture and of the National Farmers' Union, and the object of a reference to it at this stage is to warn milk producers against expecting too much from it if it should come into operation on 1st January, 1934, as is probable.

The need for the reorganization of milk marketing arose from the depression of prices in the industry, particularly in those areas where the proportion of milk sold to factories of one kind or another is relatively high. Under the scheme, the more fortunate among producers, who have been getting the full liquid price for all or for the greater part of their output, will have to share this price in future with producers in their own region who are less favourably placed and who have to accept the manufacturing price for a larger part of their output. More than this, all the producers in the regions lying nearest to the great centres of consumption, where the regional price is high owing to the high proportion of milk sold for liquid consumption, may be called upon for a levy which will be distributed amongst producers in those regions more remote from such centres, where the average regional price is depressed by the high proportion of milk sold for manufacture. In such circumstances, although it may be possible to maintain the wholesale price of milk sold for liquid consumption, it does not follow that individual farmers will get prices so high as they did before.

The effect of the regional pooling of production, and the extent to which prices may be levelled downwards for some producers and upwards for others, has still to be revealed. In some quarters it is anticipated that the levelling up of values in the regions mainly or largely concerned in the production of milk for manufacture will stimulate production still further in those regions. They are, of course, the regions of cheaper production, where the grazing season is long. On the other hand, they are also the regions of summer production. Farmers whose dairies are very unlevel in summer and winter supplies must not expect, nor will they get, the same consideration in price as those who incur the expenses of autumn calving and winter feeding to maintain a level supply, and this may check any sudden expansion of milk production in the remoter regions following higher prices. Milk production can be organized at very varying degrees of intensity and cost. In the town dairies, which still remain in some of the northern cities, where every cow is at the age of maximum profit, where every stall is refilled with a freshly-calved cow directly the previous occupant goes dry, where feeding-stuffs cannot be grown and must all be bought at market prices, and where wage rates are high, the exceptional cost of milk production is only justified by the full liquid price. It is a far cry from these conditions to the dairy farmer in the warm, wet and grassy western countries, whose cows may never be housed, whose grazing season extends for nine months in the year, and whose bill for feeding-stuffs is light, and his wage rates relatively low. But between these extremes there is every grade of dairy farmer, and there are some milk producers whose methods approximate more nearly to the former than to the latter. The farmer who carries a heavy cow stock with the help of a lavish expenditure on purchased foods, and who aims at an exceptional herd average by the purchase of cows in profit instead of depending for replenishment upon his own home-bred stock, may be advised at this juncture to survey his position. Heavy feeding costs for maximum milk yield, and expensive systems of herd replacement, may fail him if he should be called upon to face a cut in the price which he was wont to receive for his milk. There need be no occasion for alarm. The new Board has wide powers to secure fair-play, not only between producers and distributors but also between the organized majority of producers and the unorganized minority. Moreover, under the Marketing Act of 1933, the control of imported dairy products becomes a possibility, and any restriction which would have the effect of raising the value of milk for manufacturing purposes to the very moderate levels prevailing only three or four years ago would remove all necessity for a levy on the producers of milk for the liquid market.

To conclude this brief summary of the changes in national policy towards agriculture during the year, and the new organizations needed to give effect to it, all those concerned in them freely admit that the new regulations, whether by way of subsidy, tariff, quota or organized marketing, are experimental. If farmers are to profit by them, they must be ready to adapt their systems as quickly and as far as may be, so as to secure the maximum of advantage from the shelter which is being organized for them. It must be remembered that the Government is not attempting to make everybody's systems of farming profitable for them. That would only be the organization of stagnation. What is being attempted is the provision of certain safeguards for the home producer, and the obligation is on him so to adapt his methods as to take the fullest advantage of them.

4. *Representative and Individual Proposals.*

During the period of gestation which preceded the delivery of the agricultural policy of the National Government, it was only natural that more than one of those deeply interested in the future of the industry should have expressed themselves upon the subject. A Committee of the Central Landowners' Association submitted a Report on Agricultural Policy to the Minister of Agriculture and Fisheries (Ref. 7), and some of its recommendations, particularly those dealing with a guaranteed price for wheat, tariffs on luxury food products, the appointment of a Reorganization Commission for Milk under the Agricultural Marketing Act, the stimulation of the home bacon and ham industry, have already been realized. But the control of imports of dairy products from the Dominions, the reform of the method of assessment of Death Duties on agricultural land, a fresh attempt to provide further short term credit for agriculture, which the Committee recommended, together with the more systematic development of land settlement and of rural industries, have still to receive the recognition which the Central Landowners' Association desires.

Lord Astor and K. A. H. Murray were concerned at what they regarded as the wheat obsession, arising out of the demands of farmers in the depressed corn-growing counties for help. These authors point out, (Ref. 8), that wheat is a crop peculiarly adapted to the methods of the pioneer in the new countries, that it is a commodity easily stored and transported, and that it occupies a very low place in the list of products which make up the total value of the British agricultural output. They suggest that the importance of livestock and of the industries dependent upon it, far transcends the importance of corn-growing in the national agricultural economy, and their argument is that subsidies to maintain the wheat acreage and to sustain a crop such as sugar beet, which is entirely uneconomic in this country, should be abandoned in favour of support for the livestock industry. Perhaps the answer to them is that the numerous agricultural systems which go to make up the farming industry cannot rightly be regarded as conflicting or interchangeable, but that each one of them has its place in the general scheme. If, therefore, the nation has decided upon a policy of protection, the question is not which of the various branches should be helped, but how to mete out assistance fairly to all.

Lord Lymington has attacked the problem from a slightly different angle. He is concerned not only to see a prosperous industry, but to secure the employment of a much greater proportion of the population in it. The suggestion in his book (Ref. 9) is that these two desirable ends can be achieved by a livestock policy to which the arable land is not subservient, but complementary, being used in greater measure to produce the fodder crops which would be needed for more intensive livestock farming.

Sir John Russell has also made his contribution, being stirred by the crisis through which the industry is passing, to forsake, for the time being, the scientific problems which have been his particular study, for a consideration of the general situation. The conclusion of his review is a statement of the incompatibility of the aims of those who want to increase production from the land, those who would make farming prosperous and those who would use it to solve the unemployment problem, wherein he unconsciously joins issue with Lord Lymington, and he points out that a decision by the nation as to what it really wants from the industry is an essential preliminary to the formulation of a successful policy (Ref. 10). On this point Dr. A. G. Ruston has no doubts, and in interesting reviews of past and present agricultural conditions he concludes that higher production, if part of a national policy to revive agriculture, will stimulate both profits and employment (Refs. 11 and 12).

In a magazine article the lessons of the agricultural crisis are also considered by J. F. Duncan, whose conclusions are a refutation of the time-honoured fallacy of the inelasticity of demand for food. "If the demand for wheat is relatively inelastic, that is not true of the constituents of a more varied diet. We are not likely to reach the consumption limits there for a considerable time, if the purchasing power of consumers were equal to their appetites." He thinks that the future of farming, not only in England but in Europe generally, lies in the supply of fresh products in their natural state, but that success in that direction will require the intensive study of consumers' demand and efficient methods of production and marketing (Ref. 13).

II.—FARM MANAGEMENT.

1. *Introduction.*

The research of the year which is grouped under this head falls into two categories. There is, first of all, the investigation of individual experience, conducted often in groups of farms and designed to furnish information by which any farmer in similar circumstances can guide his own policy or test his results. Under this head fall the cost of production studies, whether of products or of farm operations, and also the studies of farmers' financial accounts as commonly kept by them, which are made in some areas in connexion with the economic advisory service.

Secondly, there are the agricultural surveys of many kinds, which are undertaken for a variety of purposes. Some are designed to study new crops or new systems of farming, as for example, the survey of the sugar-beet industry, which has been carried on in all the beet-growing districts since 1923, or the survey of the open-air milking bail, upon which a report is shortly expected. The object of work of this character is to give information to those who are considering whether to embark on the new enterprises, and to supply comparative information to those already engaged in them.

Another type of survey sets out to investigate the economics of production of some particular agricultural commodity, or some well-defined farming type. Examples of these are afforded by the survey of strawberry growing in Hampshire, and cattle ranching in Radnorshire, to which reference is made below. Properly conducted, such surveys are valuable, as they indicate the general state of the industries studied, with particular reference to the organization of production and marketing, and they generally provide a financial analysis of individual costs and returns by which to measure the relative efficiency of producers. It is impossible not to recognize a serious loss in some of this work, in the failure to secure more collaboration among research workers. The value of a strawberry survey in Hampshire to local growers is obvious, but it would have been greatly enhanced if it could have formed part of a general survey of the strawberry-growing industry in all parts of Britain where it is of importance, conducted at the same time and upon a uniform plan.

Again, there are general agricultural surveys, organized in districts, irrespective of the commodity or the type of farming. To this category belong the survey of farming in the eastern counties and the report on farming in Scotland, to which reference is made below. Such surveys are of value to the national administration and to the interested layman, for the information which they supply on the profitability of different types and sizes of holdings under the prevailing economic conditions, rather than to the farmers concerned.

These categories are, of course, only generally descriptive of the work in progress at various places in the study of the economics of farm management. Work cannot always be so closely defined, and the two categories into which it is divided here may merge, as when an analysis of financial accounts is the corollary to a study of a farming system, or when detailed operation costs accompany the survey of the production of a new crop.

2. *Farming Costs.*

(*a*) *Crops.* In many parts of the country, hay to-day is practically unsaleable, and in the absence of a market for it, the farmer's only interest in the crop is its value as a farm food, contrasted with the cost of making it. As the result of an investigation carried on by J. Wyllie in the south-eastern counties, he found that the average cost of 61 crops of meadow hay, representing nearly 2,500 acres, was about £1 a ton less than its value as a farm food. It may be pointed out, however, that this may not finally dispose of the question of the economy of hay-making, for a case has come to light in which hay was offered so cheaply that a big dairy farmer was able to buy large quantities at prices less than his cost of production. This may be regarded as exceptional, however, and speaking generally, Wyllie's figures for the cost of meadow hay supply a useful basis for the estimation of costs and values. It may be noted that the results from a concurrent investigation of the costs of upwards of 1,800 acres of seeds and clover hay were less advantageous to the grower, the total cost per ton on the average of 75 crops being slightly in excess of the estimated and feeding value (Ref. 14).

The growing of mangolds, another farm food, has been declining fairly rapidly in recent years, especially in those districts where sugar beet cultivation has spread. Figures for the average cost of growing mangolds on a group of farms in the midland counties, analysed by A. Bridges, justify this decline, for it is very doubtful whether the farm value of the crop, calculated from the prices at which substitutes could be purchased, is so high as the cost of growing the crop on many farms. Certainly where beet is grown in any quantity, the tops and slices are a cheaper substitute (Ref. 15).

A note by R. N. Dixey on the costs and returns of the wheat crop just before the introduction of the wheat quota scheme, is of more than historic interest, for figures are quoted of comparative costs when horse labour and when mechanical traction are employed. He concludes that even under fully mechanized systems of production, including the use of the combine-harvester, wheat-growing at a profit would be impossible at the level of prices prevailing in 1932 (Ref. 16).

In England, oats are grown probably more as a farm food than as a market crop, but in parts of Scotland it takes the place of wheat as the principal saleable grain. In response to inquiries received at the North of Scotland College of Agriculture, A. D. Imper compiled an average cost of producing one acre of oats in the north-east of Scotland. Both on clean land and on lea land the figures were extracted from farms on which full cost records were kept, the cost being £7 an acre on the latter and about 15*s*. more on the clean land (Ref. 17).

(*b*) *Labour*. Turning now to labour, some interesting figures are available for the cost of horse labour and also for tractor costs. Wyllie has published a report upon the cost of horse labour over a series of years on a number of farms in the south-eastern counties, which shows a steady fall in the cost of keeping a farm horse and so, of course, in the cost of his day's work, since the year 1926. The average cost during the first three years was £36 per horse per year, while during the last two years this figures had fallen to £30. The average is the result of a considerable range, the item for the cost of foods showing the greatest amount of variation from farm to farm. Wyllie suggests that there is room for more attention to the rationing of horses on the basis of work done, similar to the rationing of cows on the basis of milk produced. Provided that horses are fed according to the amount of work they are called upon to perform, there should be no great variation in the cost of the horse-hour of labour, notwithstanding that conditions of soil, farm lay-out and other factors on the farms concerned may introduce wide differences in the number of working days in the year on each (Ref. 18).

It is impossible to compare the cost of work done by horse labour with that of work done by tractor labour by a simple comparison of relative costs per hour, for these must be related to the quantity of work performed. Comparative tractor costs, however, in terms of one hour's work, are useful to the farmer as indicating the operating conditions which make for higher or lower costs. The costs of operating nine tractors have been worked out by J. R. Lee, and it is interesting to note that the determining factors in the economy of tractor work are not, as might be supposed, the number of hours worked in the year, or the arable acreage cultivated, as they would be if there were a common standard of efficiency in the care and use of tractors. Farmers should note that the figures show the widest inconsistencies in the consumption of fuel and oil, in the cost of repairs, and in the rate of depreciation (Ref. 19). It seems quite certain that the average skill of the farm mechanic, on farms where tractor work has been introduced, does not yet attain to that reached by workers with horses and horse implements, and it may be suggested that County Agricultural Education Committees in those parts of England where mechanical cultivation is spreading, might give much practical help by organizing local classes during winter evenings for instruction in the care and management of the new machinery.

(*c*) *Milk.* The increase in the number of tuberculin-tested herds for the production of Grade A (T.T.) Milk is not very rapid. There are probably several reasons for this, two of which may be the lack of confidence in the test and the difficulty of dealing economically with reactors on any but considerable holdings. Now, however, that it is intended to exempt this class of milk producer from the terms of the national milk-marketing scheme, its numbers may be augmented more rapidly. It is of particular interest, therefore, to read a report by J. Wyllie of the experiences and financial results of building up a tuberculin-tested herd on the College Farm at the South Eastern Agricultural College. It is admitted that the conditions are not entirely those of the normal commercial farm, but these are clearly set forth and, when every allowance has been made, the results are valuable in themselves while the financial returns justify the attempt to convert an ordinary commercial herd into a tuberculosis-free herd (Ref. 20).

Studies in the cost of milk production on some Welsh farms have been in progress at Aberystwyth, under the direction of J. Pryse Howell, since 1925, and a report on the earlier work is now available in which the figures are applied to an examination of the efficiency of production under different conditions of management. Although conditions in Wales may differ rather widely, both as to climate and herd management, from those in some of the more important milk-producing areas in England, the methods of this investigation and the emphasis which it lays on the influence of various factors in the efficiency of production, will well repay study (Ref. 21).

Another publication dealing with the cost of milk production more from the philosophical than from the accountant's standpoint comes from J. Orr, and students should find it stimulating reading (Ref. 22).

3. *Farm Management Surveys.*

(*a*) *Strawberry Growing in South Hampshire.* This district is well known for its production of early strawberries, and the origin and growth of the industry here is one of the minor romances of market-gardening. Recently, a detailed investigation of the operations of 350 growers, members of the Swanwick and District Fruit Growers' Association, was undertaken by E. Thomas. The results are of very considerable interest, and it is by no fault of the investigator that they are deprived of the comparative value which they might have had if complementary studies in other strawberry growing districts had been organized simultaneously. The industry is in the hands of a multitude of very small cultivators, the average size of 350 holdings being 3¾ acres, while only 17 of the 350, or less than 5 per cent. of the total number of growers, occupy 10 acres or more. In these circumstances, it was obvious that the basis of the business would be the exploitation of family labour, and so it proved. Bulking the holdings, which extended to rather more than 1,300 acres, a surplus of £6 18*s.* 1*d.* per acre was realized for the 1931 crop, or rather more than ½*d.* a pound of fruit. But from this sum nothing had been deducted for the cost of the unpaid family labour. An accurate account was forthcoming of the hours of labour contributed by the family, and pricing this at current wage rates, the surplus is converted, on paper, into a heavy deficit (Ref. 23). This, of course, is a very general experience when the labour of the family-farmer is priced at local rates for time and overtime and brought into the accounts as a cost. But it must not be taken as the last word upon the question of the economics of family farming, or as a general condemnation of small holdings. The man who is working for himself is thinking more of his gross returns and of the life he has, than of the rate per hour at which his labour is rewarded.

(*b*) *Cattle Ranching in Radnorshire.* Another local study, which might with advantage have been linked up in a general scheme including the other stock-raising districts concerned, if this had been possible in the present organization of economic investigation, is S. Morris' survey of store cattle raising in a part of Radnorshire (Ref. 24). Here are farms, most of them small when judged by English standards, where farming of the simplest character is pursued, Hereford herds being maintained on the grass at the very minimum of expense, each cow rearing her calf and very seldom more than hers. Pasture, hay and straw account for 60 per cent. of the total cost of the cow, which is less than £8 per annum, while the estimated value of the calves reared exceeded the average cost by about 15*s.* per cow. The system is primitive in the extreme, but it produces the highest quality of store cattle, and given a return of prosperity in the grazing and winter feeding industries, there might be room for a considerable expansion of this type of farming in conjunction with the upland grazing reclamation work which is being studied by Prof. R. G. Stapledon at the Welsh Plant Breeding Station and practised by Mr. Stanley Bligh, at Cilmery.

(*c*) *Farming in the Eastern Counties.* In 1931, a comprehensive survey of six counties, forming part of the advisory province attached to the University of Cambridge, was begun by Messrs. Carslaw, Menzies-Kitchin and Graves. It was a general farm survey, directed to the investigation of the organization of farm management and its financial results in the area. Data were collected from about 1,000 farmers, occupying together about 160,000 acres of land. Statistical data covering the widest possible range of matters were collected and tabulated, and the result is a report containing a mass of information on details of importance, although the only general conclusion that can be drawn is that farming in these six counties was in a bad way in 1931 and that it has got worse since. The authors themselves regard the work largely as exploratory, designed as an aid in the development of a technique for advisory work amongst farmers. In this matter they are evidently confronted with the common experience that while there is little difficulty in collecting economic data about farms, its application to the advancement of farming efficiency is quite another matter. This work may be assisted in the future by the removal of some commodity prices from the range of market fluctuations by the various controls already introduced or contemplated. The authors remark, for example, on the value of price forecasting in making up the farm budget. This is now as easy for the wheat crop as it has always been for sugar beet, and bacon pigs, milk and potatoes may soon be removed from the realm of uncertainty also.

The survey is to be repeated in subsequent years (Refs. 25 and 26).

(*d*) *Farming in Scotland.* The work which forms the subject of a report on farming results in Scotland gains very much in its general usefulness from being a co-ordinated effort by economic investigators at all the research or advisory centres in Scotland, instead of being an isolated local study. Costing and the analysis of farm data have been going on in Scotland on selected farms under the direction of the agricultural economists at the College centres since 1928, and this is the second report on the results. The farms included are classified, first, by districts, and then by farming types, and their relative profitableness is considered. The difference in the results is considerable, although it is only the types which are predominantly arable and crop-producing which have been actually unprofitable (Ref. 27).

(*e*) *Farming in Devon.* A study of the financial results obtained on nine farms in mid-Devon, made from accounts kept continuously on each holding for the six years just ended, comes from W. Harwood Long. Though the interest of the record is now mainly historical, it is useful as indicating the violence of fluctuations in the profits of farming, which may happen between one year and the next, arising from causes which are sometimes outside the farmer's control. Long is perhaps the first agricultural economist to acknowledge in print the over-riding importance which attaches, sometimes, to good weather and good luck, factors in farm management which are beyond measurement or calculation (Ref. 28).

III.—MARKETS AND MARKETING.

1. *Milk.*

It is accepted that the producer of milk entirely for manufacture is struggling for existence and that he loses no opportunity of getting some share of the market for liquid milk. And yet in West Cornwall there exists a community of dairy farmers, and a large one, who appear to be getting a living satisfactory to themselves mainly by the production of milk for conversion into butter. A group of 3,000 of these farmers were visited individually by a team of workers under the direction of F. J. Prewett, and the information which they supplied has been utilized in a report by him which throws an interesting sidelight on the economics of dairy farming (Ref. 29).

Another pamphlet by the same writer deals with the problems which confronted, very shortly after its appearance, the Milk Reorganization Commission, problems which the Milk Marketing Scheme has since been designed to solve. To this extent Prewett's essay might seem to be now of only historical value, but as the evidence collected by him in great detail, and in many parts of the country, differs in some fundamental matters from that which appears to have been elucidated by the Milk Reorganization Commission, the issue will be of no little interest (Ref. 30).

2. *Livestock and Meat.*

From the Economics Branch of the Ministry of Agriculture comes a report on the marketing of butter and cream (Ref. 31).

Little enough is known about the elaborate organization of the movement of livestock throughout the country. Certain districts are known to be the great reservoirs of store stock, whether cattle or sheep; others, again, are reputed to supply the needs of distant farmers in dairy cows; while pigs, for the most part, are generally assumed to be produced in the districts in which they are to be fed and to experience very little movement. The dearth of accurate information lends particular interest to J. J. Macgregor's study of livestock movements in Cornwall and Devon, for the purposes of which he has obtained complete statistics of the export of cattle from these counties and of the imports into them. Not only have the numbers been collected, but also the destinations of the exports and the origins of the imports. On balance, of course, these countries are predominantly exporting. One thing which the report brings out very clearly is that the redundancy of livestock markets is greater in these two western counties, if possible, even than in other parts of England (Ref. 32).

A very interesting paper on the distribution of meat and the consumer's demand was read by A. Jones at a conference of the Agricultural Economics Society. It has no direct application to problems of farm management beyond bringing out very clearly the butcher's preference for lightweight cattle, but it shows, once again, how fallacious is the statement that the demand for food is inelastic. The inquiry which Jones and Makins conducted into the demands for meat by consumers in a small midland manufacturing town, classified according to their economic status, showed very clearly that there is a great margin of elasticity dependent solely on purchasing power (Ref. 33).

Another publication in the Ministry of Agriculture's Economic Series deals with the marketing of wool (Ref. 34).

IV.—PRICES.

There are few things of greater importance to the farmer than a knowledge of the factors which control prices and the means to forecast them. The almost complete absence of systems of production under contract in farming, combined with the slow turnover of capital, renders the farmer more susceptible than most producers to the vicissitudes of the market. Price studies and price forecasting have formed an important, if only a small part, of the work undertaken by agricultural economists in this country, but as the application of the results must be immediate to be effective it is unnecessary to review here the work done in 1932, which applies primarily to conditions in the pig market expected in that season or in the months immediately following. For the use of students, a bibliography is given (Refs. 35–43).

On the other hand, it is too early to expect that agricultural statisticians should pronounce upon the effect of the measures taken by the State for the regulation of prices. Some preliminary notes have appeared during the year, dealing with import duties, the effects of the Ottawa agreements and the voluntary restriction of imports, to which the reader is referred (Refs. 44 and 45).

V.—MISCELLANEOUS STUDIES.

The range of investigations in rural economics carried on in 1932 extended, as in other years, beyond the limits of agricultural policy and practice. In the following notes, reference is made to special studies which, even though they have no direct bearing on the problems of production from the land, should be of interest to all those who are not too much pre-occupied with the difficulties of life on the land to-day.

1. *The Agricultural Atlas.*

In 1923, the Ordnance Survey Department published the first Agricultural Atlas of England and Wales, which had been prepared at Oxford by J. Pryse Howell. The Atlas consisted of a series of maps of crops and livestock, on which the density of distribution was illustrated by dots, each one representing a certain acreage of the crop or a certain number of livestock. To these were added similar maps showing the distribution of grass land and arable land, together with geological, altitude and rainfall maps. The result was a series of pictures showing the importance of the different branches of the complex farming industry in all parts of the country. This Atlas is now exhausted, and a revision, based on the Agricultural Statistics of 1928, has been prepared at Oxford by M. Messer and published by the Ordnance Survey (Ref. 46).

2. *The Plight of Agriculture.*

A melancholy chapter on the depression in Agriculture, particularly in arable farming districts, is the result of an inquiry undertaken by M. Messer, with the assistance of members of the Land Agents' Society and the Chartered Surveyors' Institution, in 1931. The inquiry was the sequel to a similar one made two years earlier (Ref. 47).

3. *Rural Migration.*

It is well known that there have been considerable movements of farmers out of the districts in which they were born, into others which appeared to offer attractions. The migration of Scottish farmers into the eastern and south-eastern counties, at the end of last century, is the movement most commonly quoted. The subject has now been investigated by E. Lorrain Smith, who has shown that the migration is of much larger dimensions than is generally realized, that it has been continuous, though at varying rates, for at least two generations, and that it is confined to the family-farmers of the west and north-west concerned mainly with livestock, who move into regions more predominantly capitalist and arable, in the east and south-east. The report of the investigation is good reading (Ref. 48).

4. *The Wages and Earnings of the Farm Labourer.*

Those interested in the changes in the economic position of the farm labourer during the past hundred years will find the subject comprehensively treated in an article by C. S. Orwin and B. I. Felton. It appears that the connexion between the real earnings of the farm worker and commodity prices has not always been very close, either in periods of agricultural depression, when the workers' position has sometimes improved, or in periods of prosperity, when his participation has lagged (Ref. 49).

5. *Unemployment Insurance in Agriculture.*

The prolonged depression in agriculture, combined with the spread of mechanical appliances, have had their effect upon the volume of agricultural employment, and the question of the inclusion of farm labourers in the general or in a special scheme has been considered by the Royal Commission on Unemployment Insurance. At the request of the Commissioners, memoranda upon the subject were prepared by Sir William Dampier and C. S. Orwin, both of whom, though following different lines of reasoning, came to the conclusion that insurance was desirable (Ref. 50).

This concludes the summary of such published work as can be noted here. Other articles and papers which may be recommended for reading are included in the Bibliography below. Difficult as the times may be for those who have to make their living from the land, they present subjects of extraordinary interest for study by the economist. In a world in which production seems to have outstripped purchasing power, new methods are being devised every year for increasing production still further. Witness, for example, in this series of reviews of the applications of science, the remarkable discovery of means for speeding up the growth of crops described by Dr. Bell.[1] To indicate another anomaly, it was announced that the carry-over of wheat at the end of the last cereal year was sufficient to meet the normal requirements of the wheat-importing countries for twelve months ahead, at the very moment when all the European countries were in the midst of almost a record harvest, and in our own country farmers are being stimulated by the guarantee of a moderate profit to put more and more land under wheat. In another direction altogether, the great change in national fiscal policy and in the methods now being employed for the control of output and the stabilization of prices, are creating conditions of production and distribution for which there is no precedent. The need and the opportunities for research work in agricultural economics are greater to-day than they have ever been before.

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THE FEEDING OF LIVE STOCK.

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THE economic difficulties of the times that have restricted production in so many directions in all countries are but little reflected as yet in the output of research workers, and the volume of work that requires examination for the purposes of this review grows steadily from year to year. The 3,034 abstracts of the first volume of *Nutrition Abstracts and Reviews* have increased to 3,412 items in the second volume published during the past year. Reference was made last year to the excellent review articles that appear in the issues of this new Journal, and although these are in the main designed rather for the research worker and the advanced student than for the general reader they nevertheless merit special notice here.

In this section of last year's *Guide* a brief treatment was given of the subject of "Diet and Health", which is rapidly gaining in prominence in nutrition research work, and for those interested a more exhaustive review by Dr. Noah Morris is now available (Ref. 1).

The progress of research in the physiology of nutrition has also been reviewed by Dr. Griffiths (Ref. 2), whilst a further monograph to which more extended reference may be made here is the article by Dr. Leitch (Ref. 3) on the bearing of nutrition upon reproduction, with special reference to sterility.

I.—NUTRITION AND REPRODUCTION.

The occurrence of sterility in farm animals, more particularly among dairy cows, is so common that it must be regarded as one of the major problems of animal husbandry, certainly in all countries where this is at all highly developed. Although most acute perhaps in dairy herds, breeding difficulties occur in all classes of stock and the sum total of losses must be very great. Both male and female may be involved, but, from the practical point of view, sterility in the female is the more important.

It is generally held that the causes of sterility are to be sought partly in infective, and partly in nutritional factors, but we are only concerned here with the latter. Both under-feeding and over-feeding may be contributory causes of sterility. The effect of famine in lowering fertility is known in all classes of farm animals and in human beings, and was well illustrated in some of the Continental countries during and after the Great War. Under-feeding is well-known as a cause of low fertility in range herds and in sheep on poor pastures, the lamb crop under such conditions being sometimes as low as 25 to 50 per cent.

At the other extreme "high condition" of breeding animals is universally deprecated as being adverse to optimal breeding performance. This does not rule out, however, the possible beneficial effect upon ovarian activity of a temporary over-feeding, such as is practised in the "flushing" of ewes before service. Observations are quoted by Leitch which showed an increase of 10 to 15 per cent. in the crop of lambs from flushed, as compared with non-flushed ewes.

Where the trouble arises from nutritional deficiency this is not necessarily in the total supply of food, but may be due rather to deficiency of one or more specific ingredients. So far as concerns the mineral elements clear evidence has been obtained in many parts of the world that phosphorus deficiency is a common cause of abortions and sterility. Such deficiency is of widespread occurrence in natural pastures throughout the world.

Deficiency of calcium (lime), especially if long continued, may also be a potent cause of breeding troubles, especially under artificial conditions of feeding, or where fodders grown on acid soils are used. That lime deficiency is a widespread cause of trouble under natural conditions cannot be stated as definitely as in the case of phosphorus deficiency, but on the poorer soils that have long been grazed without any replacement of lime this factor is obviously one that should receive attention.

In recent years much interest has been aroused by observations of beneficial influence upon fertility being exercised through the administration of iodine, either as such, or in the form of an inorganic salt, or through pasture manured with "iodised" salts. Such observations have been notably made in areas where the disease of goitre is endemic and breeding difficulties in domestic animals tend to occur. Whether, under conditions of intensive feeding, such iodine deficiency is likely to arise in other areas, cannot be stated with certainty, but indications of the possibility of such trouble with stall-fed cows have been obtained at the Rowett Institute in observations extending over four years.

The amount and quality of the protein supplied to the animal would seem to be another factor of importance in determining breeding efficiency. This, moreover, in natural grazings is usually correlated with the supply of phosphorus, the two tending to rise and fall together, especially in the mature herbage and under conditions of drought. So far as the quality of the protein is concerned experiments with rats have shown better results as regards early maturity, rapidity of breeding, and size of litters when animal protein, or mixed animal and vegetable proteins, were fed, than where vegetable proteins alone were given; the evidence on this point as applied to the common farm animals, is, however, more conflicting and inconclusive. Similarly it would be premature to assume as valid for the case of farm live-stock the optimum protein level for reproduction which for the rat has been found at 14 per cent. of the ration (animal protein), higher or lower levels giving diminished litter size and increased sterility.

Lastly, amongst the deficiency causes of sterility may be instanced the possible effect of vitamin deficiencies, especially of vitamin E. Whether deficiency of any other vitamin has a specific effect upon reproduction, as has indeed been claimed for vitamin B, would appear to be doubtful. The specific antisterility vitamin—vitamin E—is found chiefly in green vegetables, notably lettuce, and in the embryos of certain cereals, especially wheat. Its presence in oats, however, is doubtful. It is found in milk and egg-yolk, and is present in muscle, fat, placenta, and to a less extent in intestine and liver. It does not occur in plant oils, and is apparently absent from codliver oil, kidney, brain and testicular tissue. Whether deficiency of this vitamin occurs under natural conditions is very doubtful, only a few isolated, and not entirely conclusive, cases having as yet been reported.

A further influence of diet upon reproductive activity may be produced through the agency of the glands of internal secretion, of which two—the thyroid and the pituitary—

exercise definite effects on the ovary. Thus, either a deficiency or an excess of thyroid secretion will interfere with ovarian function, causing cessation of ovulation and sterility. The activities of the thyroid can be influenced to some extent by modifications of diet, so that sterility due to disturbance of the functions of these glands may ultimately be due to dietary irregularities.

In concluding her review of the subject, Dr. Leitch points out that in addition to the more direct influence of diet on fertility there is the other, "possibly even more interesting and important", indirect effect through modifying the susceptibility of the animal to infections. It is known that malnutrition practically determines susceptibility to certain infections, and there is evidence that it may be an important predisposing factor to infection with the abortion bacillus and other organisms that interfere with reproduction. On this subject there is urgent need for further extensive investigations.

II.—INFLUENCE OF FOOD ON QUALITY OF PRODUCT.

No claim to superiority is more persistently maintained by the British farmer than the superior quality of the home-grown food product, whether vegetable, meat or dairy product, as compared with the imported article. That such superiority in the broad sense exists can hardly be doubted and is rightly made much of as an asset in the development of improved marketing organization. The increasing stress upon the importance of securing the highest level of quality in British produce which has been noticeable in recent years will now receive a powerful stimulus through the inauguration of the new marketing schemes, some of which indeed definitely embody as a central feature proposals for quality grades and payment by quality. This is notably the case in the scheme for marketing pigs for bacon, and must almost certainly figure in any other meat marketing schemes. No such proposals appear as yet in the milk marketing scheme, but the problem of varying quality of milk is nevertheless certain to continue to create difficulties for orderly marketing until its solution is achieved.

It may be predicted with certainty, therefore, that the coming years will bring an increasing demand upon the scientist from the farmer for guidance as to the factors that determine quality in the animal product and the most efficient methods of directing their operation towards the desired end.

Much information on this subject is already available, but it is very widely scattered throughout the agricultural and scientific literature, and shows so many contradictions on points of detail that to deduce therefrom a "quality technique" for the guidance of the practical man is hardly possible as yet. Certain broad generalizations are, however, sufficiently well supported by evidence to merit acceptance. The most fundamental of these, perhaps, is that which lays down that certain quality factors are inherited and their operation can only be influenced within relatively narrow limits by the environmental, management or nutritional agencies to which the animal may be subjected. The ideal meat-making animal is born such, as is the cow that consistently gives milk rich in butter-fat. Judicious selection and mating of breeding stock must thus form the basis of any "quality policy". The animal that is genetically capable of producing high quality will not necessarily do so, however, unless given full opportunities through correct management and feeding, although it will hardly sink to the lowest level of quality even under bad conditions.

In connexion with meat production it is obvious that the conformation or type of animal must be an important determining factor in view of the large range of difference in meat value of the various parts of the body. On this subject, and the related influence of feeding and management upon the conformation of the animal at different stages of growth, the reader will find much of interest in the valuable work of Hammond at Cambridge (Refs. 4, 5, 6).

In management of the meat-producing animal the aim should be to secure uninterrupted development of the young animal, though not necessarily at the optimum rate of live-weight increase of which it is capable since this may result in a higher proportion of fat to lean in the carcase than present standards of quality require. This will be influenced to some extent by the class of animal, the degree of restriction of its freedom of movement, as well as the amount and character of the food supply, and possibly by other factors whose influence has been as yet but little investigated. Whatever the environmental and other conditions may be, however, it is a matter of common experience that the animal whose development has been hampered by illness or other abnormal cause will rarely in the end give a product of high quality.

The effects of food upon meat quality are usually most readily noted in the fat. This applies particularly to the influence of the fats or oils of the food upon the characteristics of the meat fat (or milk fat), a subject that was discussed in last year's *Guide* (p. 93), to which the reader may be referred. Subsequently published information on the more scientific aspects of fat metabolism will be found in Verzar's monograph on the absorption of fat (Ref. 7) and the continued work of Professor Hilditch and his colleagues at Liverpool (Ref. 8).

Although the changes in the chemical composition of the body-fat (or milk fat) that can be effected by varying the nature and amount of the food-oil are relatively small, and in no case produce a fundamental change in the character of the fat, they may nevertheless be of great economic importance since "quality" in the fat is determined primarily by its degree of softness or greasiness, which may be greatly affected by small changes in the fat. The degree of softness or firmness of fat that denotes high quality naturally varies with the different meats, and cannot be defined in terms of any numerical criteria, other than the subjective application of "inspection points" by the experienced meat grader. By the judicious selection of oily foods much can be done to ensure the proper quality of fat in the carcase. Thus where experience shows a tendency to production of unduly hard fat from a particular ration, as so often happens in beef and mutton production, the inclusion of a food containing a softening oil (*e.g.* maize or rice meal) should be advantageous. Similarly, in the production of pork and bacon, since we are dealing with a fat which is normally rather soft, and all too easily made too soft and oily, the feeder for high quality will usually be well advised to keep the supply of softening oils in the food down to a minimum. In this respect, barley, wheat and tapioca flour undoubtedly have advantages over maize and oats.

The food oil is by no means the only food factor that may influence the quality of the meat, both fat and lean parts, but, beyond empirical observations of the effects of individual foods, the information available on other points is all too scanty and reveals little in the nature of guiding principles. A carefully planned attack upon this subject will almost certainly be called for in the interests of the farmer as and when systems of meat grading by quality become universally established as the basis upon which his returns for fat animals are assessed.

III.—NUTRITIVE VALUE OF GRASS AND HAY.

(a) *Pasture Experiments.*

Interest in the study of the composition and value of pasture and fodder plants at different stages of growth and under different conditions of manuring and harvesting continues unabated, and is now world-wide in its scope, recent observations having come from Canada, Australia, Scandinavia, Germany, and Switzerland, as well as from this country.

The pioneer work of Woodman and his colleagues at Cambridge has been continued (Ref. 9) with a study of the effect upon the yield, composition and nutritive value of pasture herbage when close-grazed during 1931 at regular five-weekly intervals. The lengthening of the interval between successive cuts from four weeks to five weeks was found to cause a slight lowering of digestibility, especially during the flush period of growth, the ingredient most affected being the crude protein. The digestibility of the fibre remained relatively high throughout the season, and, provided the rainfall is adequate to prevent premature lignification of the herbage, it would seem possible to maintain throughout the season a herbage of reasonably good nutrient content and digestibility even when cutting (or grazing) takes place only at five-weekly intervals.

Under this system the herbage obtained in the very earliest part of the season (April) was found to have the protein-rich nature characteristic of herbage mown at shorter intervals, the dry matter on the average having a starch-equivalent of 68·6 per cent., including 18·8 per cent. of digestible protein, giving a nutritive ratio of 1 : 3·05. Thereafter, during the flush period of growth the digestible protein fell steadily to 10-11 per cent. in May and June, the nutritive ratio widening correspondingly to 1 : 5–6. It is estimated that a full ration (30 lb. dry matter) of such herbage will cover the needs for production of 4 gallons of milk, whereas the earlier work with four-weekly cuts showed that under that system the May–June herbage would provide for 5 gallons of milk. For fattening stock the five-weekly mown herbage provides ample protein at all times.

During July, August and September the digestible protein content of the five-weekly mown herbage gradually rose again until it became practically equal to that obtained at the same time of year in previous tests with four-weekly cuttings. On the average of the whole season the dry matter of the five-weekly mown herbage contained 63·9 per cent. of starch equivalent, including 12·6 per cent. of digestible protein. The corresponding averages for monthly mown grass in the earlier experiments were 67·0 per cent. and 14·1 per cent. respectively. The total produce of starch equivalent and protein per acre were, however, rather higher on the five-weekly than on the four-weekly system of grazing, although in practice in a good growing season this might not be realizable owing to the greater difficulty of securing close grazing without waste.

The five-weekly mown herbage, even at the worst, contained ample supplies of lime and phosphate to meet the requirements of dairy cattle.

The wide application of the conclusions drawn from this and the earlier Cambridge work is strikingly exemplified by the substantial confirmation reported from such widely separated parts of the world as Washington State (Ref. 10), Massachusetts (Ref. 11) and Norway (Ref. 12). Other contributions of interest on the general question of the variation in composition of grasses, clovers and other forage plants, to which extended reference cannot be made here, have come from Australia (Ref. 13), and Sweden (Ref. 14).

Considerable interest also attaches to the application by Thomas and Elliott (Ref. 15) of the modern chemical methods of investigation to the produce of the classic plots at Cockle Park, with results which, though affording little confirmation, would hardly seem to warrant any material change in the general conclusions drawn by Somerville from the grazing data.

A somewhat novel line of study has been followed at Aberystwyth (Ref. 16) in a comparison of the composition of the produce of four species of grasses when grown in a mixture, separately in pure plots, and separately in pure drills respectively. The plots were sown on May 12th, 1930, cut in July, 1930, and again in October, 1930. The first pasture cut with which the report deals was taken on May 5th, 1931, and further pasture cuts on June 4th, July 5th, and September 28th of that year. The hay and aftermath cuts were taken on June 19th and August 27th, 1931. Except for liming in the autumn of 1928 the land had received no manure, nor was any applied during the test.

The four species of grasses used were cocksfoot, timothy, meadow foxtail, and fine-leaved red fescue. It was found that, whether as pasture, hay or aftermath, the grasses grown in drills were consistently more nitrogenous than the same grasses grown in mixture or in pure plots, this being doubtless due partly to the "border effect" familiar in experimental plots, and partly to the greater disturbance of the soil involved in the drill culture. The grasses grown in drills made a more vigorous growth and the herbage had a higher proportion of stem to leaf, but the stems were more nitrogenous, than in the case of the grasses grown in mixtures or in pure plots. The potash content of the same grass as pasture was always higher, and the lime content lower, when grown in drills than when grown in mixture or in pure plots. The phosphoric acid content of the aftermath of the grasses grown in pure plots was always higher than when the same grass is grown in mixture or in pure drills.

(b) *Losses in Hay-Making.*

Whilst the newer grassland research is chiefly concerned with pasture problems there are now signs of a revival of interest in the parallel problems of the hayfield to which the major part of pre-war grassland research was devoted. That many factors, such as the botanical character of the herbage, stage of growth at cutting, soil, manuring, conditions of making and storage, etc., impart an extremely variable nutritive character to hays as consumed is familiar knowledge and need not be enlarged upon here. For a review of the work of recent years upon the whole subject of hay and hay-making, the reader may be referred to a recently published summary (Ref. 17), and we propose here to deal only with some of the studies of the losses of nutrients involved in hay-making that offer points of interest.

Although the conversion of grass into hay is primarily a simple reduction of moisture-content, this can never be effected, even under the best conditions, without some direct loss of nutrients and some change in the nutritive value of what remains, if only through the increased work of mastication and digestion imposed by the relatively hard, fibrous hay as compared with the soft succulent grass from which it is made. Under ideal conditions the total loss of nutritive value may be but small, but under adverse conditions, when the normal causes of loss are supplemented by greater mechanical losses due to the extra handling required, and by direct loss of nutrients through the leaching action of rain and the activities of fermentative organisms, the losses may be very great.

On this subject a long series of experiments on the losses involved in different methods of preserving grass under Swiss conditions has been carried out at Zurich, and the summary of results recently published by Professor Wiegner (Ref. 18) is full of interest and in some respects almost sensational. Even for artificial drying under laboratory conditions, with every effort to prevent loss, an average loss of nutritive value (starch equivalent) of 10–15 per cent. was recorded, whilst for natural drying as hay without mechanical loss the average rose to 20–25 per cent. For natural hay-making on trestles the loss was 30–35 per cent., and for hay-making on the ground, 40–45 per cent.; all under good weather conditions! These losses are much higher than those reported in the older experiments, in which, however, only the reduction in the weight of dry matter harvested was considered, without taking into account its reduced nutritive value per unit weight. In some of the older experiments, however, in which this was taken into account, losses under bad weather conditions of as much as 64 per cent. of the starch equivalent of the original greenstuff have been recorded.

In a Swedish test (Ref. 14), with clover-timothy aftermath dried on wire racks under good weather conditions at the end of August, the combined effects of loss and lowered digestibility represented a loss of 35 per cent. of the nett energy;

including a loss of 28 per cent. of digestible true protein. Similarly in a German test (Ref. 23) where three successive cuts of hay were taken and dried in various ways the loss of starch equivalent when dried on the ground was 46 per cent. and of digestible protein 48 per cent., whilst the corresponding losses when the hay was dried on wooden stands were 32 per cent. and 26 per cent. respectively.

As against the foregoing results much lower losses are reported in experiments carried out on seven farms for two years by the Agricultural College of Norway (Ref. 19). In these tests a comparison was made of drying on the ground, drying in cocks, drying on frames, and drying artificially in the laboratory. The digestibility of the fresh hay made by the various methods was determined with sheep, and these measurements were repeated on the hay after different periods of storage. For cock or frame drying under variable weather conditions the results showed an average loss of 14–15 per cent. of the "feed units" of the original grass, whilst in artificial drying, where as a rule the process was completed in 24 hours and no mechanical loss occurred, the loss of food value, if any, was too small to be measured. During storage the hay lost a further 5–10 per cent. of food value, so that the total loss in drying and storage amounted to about 20 per cent. of the original "feed units" of the grass. Although this loss is appreciably less than that reported by most other experimenters, and far below Wiegner's figures, it is nevertheless sufficiently great to point the warning as to how great may be the losses in ordinary farm practice, if the greatest pains be not taken to avoid careless handling and undue exposure. These data also afford abundant justification for the efforts now in progress to develop artificial methods of drying to which reference is made in the next section of this report.

In addition to the losses in haymaking that fall on the nutrients which together make up the "starch equivalent" of the hay, it is further of interest to know how the vitamins of the fresh greenstuff fare in the hay-making process. On this point American experiments with alfalfa (Ref. 20) are of interest. In these experiments carried out at the Arizona Experiment Station, where solar radiation presumably develops a high intensity, the vitamin A and vitamin D values of alfalfa leaves which had been allowed to lie spread out in the field for varying lengths of time were compared with those of leaves taken from the field immediately upon cutting and dried in a well-ventilated darkened store. A loss of from 20–33 per cent. of the vitamin A found in the sample cured in the dark resulted from allowing the alfalfa to lie spread out on the field for 2½ hours round about noon. No loss of green colour in the leaves took place;

nor was the loss of vitamin A appreciably increased by 6¾ hours exposure. When the alfalfa was allowed to lie on the field overnight until 8 a.m. the next day the loss of vitamin A increased to 75 per cent., and this loss rose further to 84 per cent. when the exposure was prolonged until noon on the second day. Alfalfa severely bleached as a result of one-week exposure to sun and rain on the field in the swath showed only 4 per cent. of the vitamin A present in the sample cured in the dark. Similar results have also been obtained in Nebraska (Ref. 21), where also the vitamin E content of the alfalfa was found to be reduced by exposure to the sun. English experiments (Refs. 22 and 28) similarly show that artificially dried grass is more effective than ordinary hay in maintaining the vitamin A content of the butter fat of cow's milk during the winter.

The Arizona observations with regard to vitamin D were, however, in striking contrast with those for vitamin A, since exposure to the sun, instead of reducing, actually increased the anti-rachitic potency of the alfalfa. The longer the exposure the higher was this potency. In one case alfalfa was left in the swath for a period of one week, during which the sun shone 57·3 hours and 0·37 inch of rain fell, and at the close was found to be highly anti-rachitic.

Similar results were also obtained by Russell in New Jersey (Ref. 23).

(c) *Artificial Drying of Fodders.*

The drying of moist vegetable products by means of artificial heat has long been practised on the Continent, especially with reference to sugar beet pulp and potatoes. It has also been applied successfully to the conservation of sugar beet tops. These materials, however, are all relatively poor in protein, and therefore the tendency towards lowered digestibility of protein on heating above 60°C. that was shown in the older experiments was of little practical consequence. [A brief summary of the older work is given in a paper by Meier (Ref. 23a).] The conclusion was generally drawn from these experiments that heating methods could not be applied to products relatively rich in protein. The problem has been reopened in recent years, however, with the improvements in drying technique that make it possible to dry large masses of succulent produce at relatively low temperatures, and in particular the possibilities of grass drying are now being extensively tested.

The earliest reports on the artificial drying of grass date as far back as 1870, but it is only in recent years that the problem has been seriously studied.

Brief reference was made in last year's *Guide* to the work of the Jealott's Hill Station on the subject. There it has been found that drying in a band drier operating with an air-inlet temperature of 200°C. results in scarcely any loss of digestibility and nutritive value.

In tests recently made in Germany (Ref. 24) the "band" type of drier proved superior to the "drum" drier. In the product from the former the proportion of digestible protein was actually a little higher than in hay made from the same material by ordinary methods, and the total of digestible nutrients harvested was naturally greater because practically no mechanical loss took place. With the drum drier the digestibility of the protein was slightly reduced. A similar result was obtained in Swedish tests (Ref. 25) with the drum drier, in which the depressing effect on the digestibility of the protein was found to increase with rising temperature of drying. With a temperature of 155°C. 9 per cent. of the food value (measured in feed units) and 20 per cent. of the digestible protein of the original grass was lost, whilst the corresponding losses at 245°C. were 18 per cent. and 32 per cent. respectively. In a later test (Ref. 14) the losses were 11 per cent. and 30 per cent. respectively. In contrast to these last results grass dried at low temperatures under reduced pressure in a vacuum-drying apparatus designed for grain drying, showed no loss of organic matter and only 3 per cent. reduction in digestible protein; this method, however, is admittedly too expensive for forage crops, but may be of great value for preserving vegetables, as the product retains its colour and vitamins and shows a high swelling capacity when wetted.

From Wisconsin (Ref. 26) tests are reported with the Koon drier, the special feature of which is that the material is exposed to a very high temperature, but only for a few seconds. In this case the whole time consumed in the drying process was not more than one minute and the highest temperature recorded for fresh green material was 480° to 535°C. with an exposure of 40 seconds. Where the material had already been partly dried lower temperatures were used at the inlet. In spite of the high temperatures used the hay came out of the drier retaining a pea-green colour, and on testing by metabolism experiments with heavy-milking cows it was found that the availability of the dry matter, protein and calcium was little different from that of the ordinary field-dried material, the material used in each case being second-cut alfalfa.

Digestibility tests carried out at the Washington Experiment Station (Ref. 27) with mixtures of grasses and clovers dried at 100° to 200°F. in an oven for about 12 hours; using dairy heifers as experimental animals, showed a total digestible nutrient content of 64·7 per cent., a figure substantially lower than that found in earlier tests in this country with cows and sheep, but not far short of the average given in Kellner's tables for protein-rich hay.

As to the effect of artificial drying on the vitamin content of the fodder, reference was made in the preceding section to American experience that alfalfa dried artificially was richer in vitamins A and E, but poorer in vitamin D than sun-cured alfalfa. Reports of practical feeding tests with artificially dried grass are but few in number but in general show advantages in certain directions as compared with hay. Thus Watson and his colleagues (Ref. 28) found in a feeding test at Jealott's Hill with two types of artificially dried grass, and of grass silage, that the yellow colour and vitamin A content of the butter fat of cows was much better maintained through the winter with the dried grass than with silage, especially where the produce came from grassland that had received nitrogenous fertilizer. No appreciable differences were observed in the yield and general composition of the milk, though there were indications that artificially dried nitrogen-treated grass kept the calcium content of the milk at a higher level in the winter period.

The use of artificially dried alfalfa in the rations of laying hens is similarly found to promote the colouration of the yolk.

In a pig-feeding test at the Harper Adams College, on which the full report is not yet available, finely-ground dried grass was compared with wheat sharps, and although the material tested was little better in composition than good hay, and therefore hardly promising material for pig feeding, it was found possible to use it in replacement of sharps up to about 15 per cent. of the total ration without any measurable detriment to the rate of live-weight increase.

IV.—Ensilage.

The object of the process of ensilage of greenstuffs is to conserve them for winter feeding with as little loss as possible. This is effected through the development in the mass of green fodder of a variety of fermentative activities, of which the most desirable is the pure lactic acid fermentation. The character and extent of these fermentations is determined by various factors such as the nature of the raw material and the method of packing it in the silo, and may be further influenced by the addition of certain chemicals. This latter possibility has attracted much attention in recent years, especially on the Continent, where various devices have been tested of which a review is given in a recently published article (Ref. 29).

In recent years the idea of influencing the fermentation in the silo with a view to reduction of loss of protein, by mixing acids (lactic, formic, hydrochloric) with the material, has been developed in a variety of processes, of which that developed in Finland by Dr. Virtanen is now attracting considerable attention, under the name of the A.I.V. Process, in our own country, where numerous tests are being made by Imperial Chemicals Industries, Ltd., the holders of the patent rights (Ref. 30). In Finland the process was first tried on a practical scale in 1927 and by last year was said to be in use on over 13,000 farms. In this process the fresh fodder is brought up to a standard acidity (pH, 3 to 4) by spraying with dilute hydrochloric acid, containing a little sulphuric acid, various layers of material as they are filled into a cheap wooden silo. Mould growth on the surface is prevented by spraying with an anti-mould preparation, and the material finally sealed as tightly as possible and covered with soil. It is claimed that there is only a trivial loss of nutrients and that practically the only free acid remaining in the finished product is lactic acid. The silage is said to be well relished by animals and when fed to dairy cows in winter to give a milk equal in vitamin content to summer milk. Feeding trials quoted by Virtanen (Ref. 31) showed that cows receiving a daily ration of A.I.V. silage equal to about 10 per cent. of their live-weight did not suffer any detriment to health or to the weight and composition of the bones and tissues. "In short, A.I.V. fodder has in all respects proved to be a very wholesome food. Horses, pigs and poultry have also been fed on A.I.V. fodder with success." Despite these confident claims the merits of the process under British conditions remain to be demonstrated and no evidence is yet available to warrant any recommendation for its general adoption.

V.—LUCERNE.

The lucerne crop was first introduced into this country in the seventeenth century and has subsequently always had a considerable vogue in the south-eastern counties, beyond which area, however, its spread has only been slow and irregular. In recent years improvements in the technique of lucerne growing have led to renewed efforts to secure a greater use of the crop in other areas, but these have met as yet with but little success. There can be little doubt, however, that there are many areas in which the crop is not grown, but where it could now be grown to advantage if its merits as fodder are what they are commonly claimed to be. As to these merits in so far as they derive from the composition of the lucerne plant we are almost entirely dependent upon information derived from American and Continental sources, but this defect will be remedied by the work that has now been initiated by Woodman and his colleagues at Cambridge (Ref. 32).

The data at present available have reference to the 1932 cuttings of two one-year old, and two four-year old crops grown in Cambridge and Suffolk, and are described as only preliminary to more systematic investigations now in progress.

The four-year old crop grown on the Cambridge University (Howe Hill) farm from Provence seed, when cut at a very early stage (plants only 3-5 inches high), showed the extremely high proportion of 35 per cent. of crude protein in the dry matter, which had fallen, however, to 20·4 per cent. by the time the bud stage had been reached, and still further to 17·4 per cent. at the flowering stage, at which under practical conditions the first cut would normally be taken. The proportions of crude fibre at the three stages of growth tested were 13·7, 23·9, and 29·7 per cent., respectively. This lucerne when cut at the flowering stage was thus as fibrous as grass at the stage when it is normally cut for hay, and far more fibrous than pasture herbage grown under a system of frequent cutting. Only in its mineral content, and especially in lime, would this lucerne appear to have been superior to the latter. The lime content increased as the lucerne progressed in maturity until at the flowering stage it had reached 4·9 per cent. of the dry matter. The content of phosphoric acid was very much lower and tended to fall with increasing maturity to a figure of about 0·7 per cent. at the flowering stage. In content of potash and chlorine the lucerne was also inferior to pasture herbage.

Digestion trials with sheep indicated that the lucerne, both in bud and in flower, was distinctly inferior, both in digestibility and nutritive value, to the herbage of pastures cut at intervals of from one to five weeks, the difference being particularly marked in the case of the fibre, which in lucerne is woody and of low digestibility. It is clear, therefore, that lucerne as commonly cut in the flowering stage must be regarded as more nearly comparable to a good coarse fodder such as hay than to the produce of well-grazed pasture. Its superiority to meadow hay lies in its higher content of crude protein and lime.

The second and third cuts of this particular crop gave results similar to the above, except that the third growth was consistently richer in protein than the first and second growths, an observation that was confirmed in the crops from two other farms.

The produce from the other centres showed, so far as protein content and general organic composition were concerned, a good deal of resemblance to the foregoing, but varied considerably in regard to mineral composition, which would appear to vary greatly with differences in soil conditions and manurial treatment.

VI.—PROTEIN SUPPLY.

Protein supply problems have long furnished an attractive field for the nutrition investigator, and continue to figure largely in the literature.

Research on the make-up of the individual proteins themselves, and on the significance in nutrition of the various constituent amino-acids and other relatively simple nitrogenous compounds out of which the proteins are built up, and into which they are resolved by the digestive agents, has established the necessity for taking into account in farm feeding practice not only the quantity of protein supplied but also its "quality". On the differences in " biological value " between individual proteins when used as the sole source of protein supply for the animal we have now a considerable amount of information. Thus, for example, we have evidence that the proteins of maize and of wheat, when fed subject to the above condition, are about equal in value, but decidedly inferior to the mixed proteins of milk; that of the latter casein is slightly superior to albumin, but either fed separately is much inferior to the mixture of the two as they occur in milk (Ref. 33).

On the farm, however, it is but rarely that a diet containing only one type of protein (*e.g.* wheat proteins alone or maize proteins alone) is fed, so that the information required for the guidance of the farmer in making up his diets is not so much the " quality " of the individual protein when used alone as its influence upon the " quality " of the whole mixture of proteins contained in the diet to which it is added. A foodstuff whose protein contains an amino-acid X, that is essential for, say, normal growth of the animal, may produce a remarkable improvement of growth when added to a diet the proteins of which do not contain this particular amino-acid, whilst the same foodstuff added to another diet no poorer in protein, but whose proteins already supply the necessary amino-acid X, may have little or no effect.

In other words, in farm practice the value of a particular foodstuff, so far as protein supply is concerned, may be dependent upon the extent to which it " fits in " with the proteins of the other foodstuffs included in the diet, and consequently may show considerable variations as between different rations. One part of the explanation of the general benefit accruing from the addition of milk to rations undoubtedly lies in the ability of its proteins to remedy the "quality" deficiencies of other proteins over a wide range of diets. Doubtless some day nutrition research will be able to supplement the advisory guidance it now gives us as to the *quantitative* requirements of animals for protein, with similar guidance as to how to blend our various foodstuffs in order to secure optimum "quality" in our protein supplies for the various purposes of feeding, but that day is certainly not yet, and for the present the farmer can only provide himself with a rough and ready safeguard against actual deficiencies of necessary "protein quality" ingredients by the use of rations containing a reasonable variety of foodstuffs. Variety in this sense is determined by the origin of the material. Thus a ration of wheat meal, bran, and wheat germ meal would be a simple one in respect of protein quality since it would supply only wheat proteins, whereas a ration of barley meal, wheat sharps and fish meal, although containing only the same number of feeding-stuffs, would give a more complex protein supply since the three ingredients are quite different in origin.

On the subject of the bearing of protein supply upon different forms of animal production a considerable number of reports have come under our notice during the past year of which only a few can receive notice here.

Protein and Wool Growth.

The wool fibre is essentially a protein material so that the relation of the protein supply in the food to the amount and character of the wool produced by sheep and other wool-bearing animals has an obvious interest for the investigator.

On this point Fraser and Roberts (Ref. 34) have published results obtained with two lots each of twenty growing sheep fed indoors on rations equal in energy content and known to produce satisfactory growth. One lot, however, received in its ration 52 per cent. more digestible protein than the other, the diet of the latter supplying less protein than Wood's standards require for sheep of the age and size used. Nevertheless, no significant difference could be detected between the two groups either in weight of wool or in respect of any of the wool characteristics measured. Moreover the average increase in body weight during the experiment was the same in both groups. It would seem doubtful, therefore, whether there was an actual deficiency of protein in the case of the low-protein group, but the supply must have been very close to the point of actual deficiency, and yet the increase of protein supply beyond this point made no difference to the rate of production of wool. This is not at variance with the conclusions from earlier work, and recently confirmed (Ref. 35), that the rate of production of wool varies with the vigour and growth rate of the animal, which are largely conditioned by the food supply. It is of interest to note that in the case of the low protein group no less than 9·2 per cent. of the digestible protein fed was recovered in the form of clean dry wool.

Protein and Milk Production.

A further contribution to the voluminous literature on the protein requirements of the milch cow has come from the Cornell University Experiment Station (Refs. 36, 37).

In experiments extending over three years, three groups of 12 cows each were fed (a) with a roughage of timothy and clover hay, plus maize silage, at the rate of 1 lb. hay and 3 lb. silage to each 100 lb. live weight, and (b) a concentrate mixture at the rate of 1 lb. for each 3½ lb. milk produced. The concentrate mixture for the various lots gave the same total supply of digestible nutrients but varying amounts of protein, *viz.*: 16, 20 and 24 per cent. total protein or 12·7, 16·3 and 19·5 per cent. digestible crude protein.

Each group received the same kind of concentrate mixture throughout the first two years, but in the third year changes were made every five weeks on a definite plan, passing from the highest to the lowest protein supply and then changing back abruptly again to the highest. In no cases were there any significant effects upon either milk or fat production. After subtracting 0·7 lb. of crude protein per 1,000 lb. live weight for maintenance, the ratios of the remaining digestible crude protein consumed to the protein produced in the milk were 127·8, 149·8 and 180·6 per cent. for the 16, 20, and 24 per cent. protein rations respectively. All three groups utilised the total digestible nutrients of the rations with equal efficiency, and there was no evidence of any specific stimulating effect of protein on milk secretion.

From these experiments therefore it would appear that the protein requirements of the cow can be amply covered by a ration providing over and above maintenance 1·28 times as much digestible protein (crude) as is contained in the milk produced from it. For milk of average Shorthorn quality this would mean a supply of about 0·44 lb. of digestible protein in the "production" food for each gallon of milk produced. This is lower than the standard (0·55) commonly worked to in British practice, but the difference is probably a little exaggerated, since the allowance of 0·7 lb. crude protein made by the Cornell workers for maintenance requirements is probably rather high.

The general conclusion that there is no practical gain either in yield or quality of milk from increasing the protein supply in the ration above a modest level comparable with the standards indicated above is also confirmed by experiments reported from the Ohio Experiment Station (Ref. 38). In these experiments comparisons were also made of the nutritive values of the milks obtained on different levels of protein feeding, but no differences, except with relation to the B vitamins, could be detected. Enough difference was found, however, in the content of B vitamins to indicate that some relationship existed between the level of protein feeding and the amount of these vitamins in the milk. No such relationship could be traced in the case of vitamins A and D.

Lastly, reference may be made to the recent confirmation by Ehrenberg (Ref. 38a) of older observations that an appreciable part of the protein in the ration of the dairy cow can be replaced by ammonium salts of organic acids without any serious effect upon milk yield. The ammonia is taken up by bacteria in the alimentary tract and built up into protein and as such utilized by the cow. Uniform experimental success over six years is claimed, but the practice has not yet been tested out by large scale trials.

Protein and Meat Production.

Cattle.—From Cornell comes also (Ref. 39) a review of the results obtained by 12 American experiment stations concerning the protein requirements for maximum gains of fattening calves, yearlings, and two-year-olds. The general conclusions as to protein and other nutrients required, in lb. per 1,000 lb. live-weight daily, are summarized in the following table:—

	Digestible crude Protein.	Total Digestible Nutrients.	Dry Matter.	Nutritive Ratio.
Calves	2·25–2·75	17·4–18·8	24·0–25·6	1 : 6·0–7·3
Yearlings	1·98–2·44	16·8–18·0	22·2–24·2	1 : 6·4–7·8
2-year-olds ...	1·70–2·12	16·2–17·2	20·4–22·8	1 : 7·7–9·0

No claim to finality is made for these "standards" but on the contrary the need for further carefully planned tests of the protein requirements of fattening cattle is stressed.

The scale of protein requirements indicated above is considerably below the Kellner standards for calves and yearlings, but slightly higher for the two-year-olds.

Pigs.—The change that has been steadily taking place during the past twenty or thirty years towards the leaner type of bacon pig required to meet the public taste finds an interesting reflection in the protein feeding standards. Thus whereas in 1911 Danish experimental work indicated an optimum protein supply of 194 gm. (0·43 lb.) per day, this has now been raised by the recent experimental work of Jespersen and others to 254 gm. (0·56 lb.), these figures representing the average daily requirements for the period in which the live weight is raised from 30 to 90 kg. (66–198 lb.). From a review of the recent Danish experimental work Clausen (Ref. 40) concludes that the optimal daily requirement of digestible protein for present-day pig feeding rises from 150 gm. protein for the 20–30 kg. live-weight period, up to 300 gm. protein for the 60–90 kg. live-weight period, with an average daily requirement for the whole period from 20 kg. to 90 kg. live-weight of 250–275 gm. digestible protein. The pigs that eat most and show the best growth-rates will deal effectively with rather more protein than those with lower appetites and slower rates of growth, and some allowance must, therefore, be made for this in practice.

It must further be kept in mind that in the Danish experiments separated milk was always included in the ration, so that where milk is not available, and substitutes for it have to be used whose proteins have possibly a lower "biological efficiency" than those of milk, it may be necessary to aim at a rather higher standard of protein requirement than the above.

This is indicated in Danish experiments in which the separated milk was replaced by amounts of meat-and-bone meal supplying the same amount of digestible protein, the rate of growth of the pigs being appreciably reduced thereby.

On the question of the protein requirement of the in-pig sow recent German experiments (Ref. 41) indicate that during pregnancy a daily supply of 150 gms. (0·33 lb.) of digestible protein is ample; probably less than this is desirable in the first half of the period. As regards the general food requirement of the sow a ration of 1·06 kg. (2⅓ lb.) starch-equivalent proved to be adequate; indeed in one experiment the sow on this allowance was appreciably heavier after farrowing than at the time of service.

On the still vexed question of the extent to which the cheaper vegetable protein foods (*e.g.*, soya meal) may replace animal protein concentrates in pig feeding some recent German experiments (Ref. 42) may be quoted. Four experiments, each with two lots of pigs, were carried out, a total of 70 weaners being used. In each test the one group (Control) received what is described as the "customary" fattening ration of potatoes *ad lib.* plus 1 kg. (2·2 lb.) of meal food consisting of 70 per cent. barley and rye, and 30 per cent. fish meal and meat meal. The other group (Experimental) received along with the potatoes in the first three tests a mixture of 58 per cent. barley and rye, 21 per cent. groundnut meal, 10 per cent.

extracted soya meal, 6 per cent. fish meal and 5 per cent. meat meal; whilst in the fourth test the meal mixture was 34 per cent. barley and rye, 30 per cent. palm kernel cake, 15 per cent. soya meal, 10 per cent. groundnut cake, 6 per cent. fish meal and 5 per cent. meat meal.

The average daily gains in live-weight per head for the first three tests were 687 gm. (1·51 lb.) in the Control groups and 637 gm. (1·4 lb.) in the Experimental lots. In the fourth test, the corresponding averages were 712 gm. (1·57 lb.) and 649 gm. (1·43 lb.) respectively. Despite the lower growth rates in the Experimental groups the costs of production of a given live-weight were lowered by the use of the soya and groundnut meals. It is recommended in the report, however, that a minimum of 100 gm. (0·22 lb.) of animal protein concentrate food should always be included in pig-feeding rations. The data available are insufficient for a critical estimate of the reliability of the conclusions, but the above account may be of interest, if only as indicating the general character of the meal supplement which German experience apparently finds to be desirable along with heavy feeding of potatoes. The high proportion of protein concentrate used is particularly interesting.

On the general question of the relative values of animal and vegetable protein for the pig Isaachsen summarizes experience in Norway by the statement that, although plant protein has been found in many cases to give as good growth as animal protein, provided the necessary minerals are supplied, yet in practice it is often difficult to get pigs to eat a sufficient quantity of foodstuffs of exclusively plant origin. He suggests that both milk and herring meal, quite apart from any merit of their proteins, have a special value, even when used in only small quantities, in stimulating the appetite. This may be true of milk, but the evidence in support is not very convincing.

VII.—VITAMINS.

Research into the nature and mode of action of the vitamins and other essential "accessory factors" of diets continues apace, and is steadily producing results of high scientific interest, which, however, as yet appear only to impinge directly upon farm feeding practice to a very limited extent. Especially interesting, however, is the growing evidence of the existence of other factors, besides the vitamins, that are essential to the nutrition of the young growing animal, such as that present in liver which is under investigation at Cambridge (Ref. 49) and elsewhere.

For a comprehensive survey of the present state of knowledge of vitamins and their relation to various nutritional problems the reader may be referred to the excellent report issued by the Medical Research Council, of which the third revised edition is now available (Ref. 43). The special significance of vitamins in relation to infant feeding has been reviewed by Hume (Ref. 44), and in relation to pig-feeding by Sheehy (Ref. 45). From his review of recent experimental work the latter comes to the conclusion that under practical conditions of pig feeding the only vitamin deficiency likely to arise at all commonly is that of vitamin D. Such deficiency can be avoided, however, by the supply of codliver oil, by liberal feeding of milk or green food, or more easily, by exposure of the pigs to sunlight. "The requirement for vitamin A is so low that, except under experimental conditions where the diet is purposely designed to contain as little as possible, there is no great danger of deficiency. Either yellow maize, green food, or milk given in substantial amounts will supply all that is necessary. Indeed if the animal gets an occasional run on pasture there is no need to worry further about this vitamin."

The risks of vitamin deficiency, so far as the needs of growth are concerned, are even less with cattle and sheep, owing to the more "natural" methods of feeding and management generally followed, although, as previously noted (Ref. 28) the vitamin content of the milk and butterfat yielded by the dairy cow may vary appreciably, under conditions of winter feeding, with the nature and quality of the fodder supplied.

It is only, indeed, on the poultry section of the farm that the risk of vitamin deficiency needs to be carefully watched, and there only when highly "intensive" methods of management are being practised.

VIII.—ULTRA-VIOLET IRRADIATION.

On the cognate subject of the influence of ultra-violet radiation upon health, more particularly through the production of vitamin D, readers may be referred to the excellent reviews by Chick (Ref. 46) and Clark (Ref. 47). The latter reviews the existing state of knowledge on irradiation with regard to the three main directions in which it may operate, *viz.* the lethal action on micro-organisms; the effect on nutrition, metabolism and growth; and the influence on resistance to infection.

On the subject of sunshine as a source of ultra-violet radiation it is interesting to note that the intensity of effective radiation on a clear sunny day in December is commonly only about one-twelfth of that on a similar day in July. Indeed from October to April it is only noon sunshine that contains any significant amount of the anti-rachitic radiations. In experiments with rats at Albany, New York, (Ref. 48) it was found that rickets could be prevented by twenty minutes exposure daily in midsummer, but that four hours daily was necessary in midwinter.

Chickens apparently require less irradiation, and the preventive dose for them found in other American experiments is given as six minutes daily in summer and one hour in winter (or one minute daily exposure at 22 inches from a mercury vapour lamp). The degree of exposure necessary will vary, however, with the diet, especially the intake of vitamin D.

Furthermore, it is now common knowledge that the anti-rachitic radiations from the sun are absorbed by ordinary window glass, but transmitted to varying extents by certain special glasses (*e.g.* Vitaglass), which transmit 40–50 per cent. of the active rays when new and 25–35 per cent. when old. Clearly, therefore, the effective use of such glass will be restricted to south windows and skylights, since elsewhere the amount of ultra-violet radiation that penetrates will be too trivial to have any measurable effect.

Although ultra-violet irradiation increases the supply of vitamin D, it is important to note that it has a destructive effect on vitamins A, B and C, and indeed, if long continued, on vitamin D itself. The practice of irradiating foods, such as milk, with a view to increasing their vitamin D potency, thus needs to be subject to critical control in order to ensure that the supply of the other vitamins is not unduly depleted.

Apart from the effect of ultra-violet irradiation in promoting the assimilation of calcium and phosphorus it is possible that it may re-act beneficially in other directions, and there is now, for example, some experimental evidence that it may help to mobilize the iron supply of the organism and accelerate the formation of new red cells in the blood.

In regard to the possible effect of irradiation on resistance to infection, few conclusions of importance have yet been reached. There is some evidence that irradiation may affect resistance to infection in the ill-nourished subnormal animal, but not in the case of the normal, healthy animal. The possibility is not excluded, moreover, that even in the case of the subnormal animal, there may be conditions in which irradiation might produce injury rather than benefit. "So far only a disordered mineral metabolism is definitely known to respond favourably to irradiation, but we may find in the future that there are other specific subnormal conditions in which irradiation is beneficial, and in which it may be used to promote the health of animals and man."

IX.—MINERAL SUPPLY PROBLEMS.

Calcium and Phosphorus.

The investigation of the mineral needs of the animal must necessarily cover a very wide field in view of the great number of individual mineral elements that enter into nutrition. Of these, prime importance in feeding practice applies to the elements calcium and phosphorus, and each year brings numerous reports of experiments dealing with the supply and assimilation of these elements.

From recent work at the Rowett Institute (Ref. 50) it would appear that the most important single factor controlling the absorption of calcium and phosphorus is the acidity of the gastric juices. An excess of calcium in the diet, by neutralizing the hydrochloric acid of the juice, precipitates the phosphorus as tricalcic phosphate, whereby the assimilation of phosphorus is lowered. In view of the rather indiscriminate use of lime in various forms in present-day feeding practice, this observation is distinctly interesting, and finds support in the evidence from practical feeding experiments that the supply of lime in rations beyond a certain proportion, which is quite low, may be definitely injurious (Ref. 51).

The optimum conditions for the simultaneous absorption of calcium and phosphorus seem to be those where calcium and phosphorus are present in the diet in approximately equivalent amounts, and in such quantity that the amount of calcium is considerably less than that required for the neutralization of the hydrochloric acid of the gastric juice.

A further deduction from the Aberdeen work that is of interest in view of the common use of bone meals for the supply of calcium and phosphorus, is that for the optimum utilization of calcium and phosphorus after absorption it seems to be requisite that they should be supplied in the food uncombined with one another, and that they should be absorbed as far as possible in this condition.

On the more practical aspects of the calcium and phosphorus requirements of the milch cow two American reports are available. At the Vermont Agricultural Experiment Station (Ref. 52) ten "balance" trials were made with five cows, all of which ended their trials with a definite surplus of calcium and phosphorus in the body. During the early part of lactation the amounts lost by the cow were normally greater than those assimilated from the food, but these losses from the body were later compensated by rapid storage as lactation and gestation progressed. When mineral supplements (steamed bone flour and ground limestone) were fed the deficiency periods were appreciably shortened. The practical necessity of feeding calcium and phosphorus supplements with good rations of concentrates fed in liberal quantities appeared to be questionable. There was also no increased assimilation when fresh grass was substituted for ensilage.

The same general conclusion as to the doubtful necessity of supplementary lime and phosphate additions to good rations was also drawn from experiments at the Wisconsin Experiment Station (Ref. 53) in which the lime and phosphate content of the skeletons of cows fed rations differing widely in their content of these ingredients was determined. Two groups of 22 cows each were fed on normal lines through the growth period and three lactations. The daily intakes of calcium and phosphorus were 25–28 gm. of calcium and about 28 gm. of phosphorus in the one group, and 158 gm. and 74 gm. respectively in the other. Seven cows from each group were killed 7–10 days after their fourth calving and certain bones removed for determination of their lime and phosphate content. No significant differences were found between the two groups.

On the corresponding problem of the calcium requirement of the brood sow experiments have been carried out at the Missouri Experiment Station (Ref. 54). The experiments, which included several breeds and covered a period of five years (1924–29) demonstrated that a deficiency of calcium may be directly responsible for poor farrowing results. During the years 1924–26 only one litter out of six was actually reared to weaning age, and these pigs had to be fed on cow's milk from the third week onwards and only averaged 17·2 lb. live-weight when weaned at eight weeks old. The data indicate that the rations for breeding sows should contain not less that 0·4 per cent. of calcium, and that amounts much in excess of this should be avoided. Examination of the metacarpal bones of the pigs fed on rations deficient in calcium showed that although the diameter of the bone was not affected, the walls were thinner and were porous instead of being dense and hard. These conclusions are entirely in accord with those obtained at Cambridge by Davidson and Evans, that were dealt with in *Agricultural Research in* 1929.

In South African experiments (Ref. 55) the lime and phosphorus requirements of young growing pigs were studied. A ration of 200 parts maize meal, 100 pollards, 50 oats, and 40 blood meal, with 1 per cent. common salt, resulted in rickets, which could be prevented by the addition of 0·5 per cent. of codliver oil. This ration would be low in calcium and optimum in phosphorus, with a calcium-phosphorus ratio of 1 : 4. On a ration with excessive calcium and optimum phosphorus (ratio 3·5 : 1) pigs developed fits, unbalanced gait, and total blindness, codliver oil having no preventive effect in this case. In another experiment the addition of one-quarter per cent. limestone to the basal diet, with a Ca : P ratio of 1 : 2·6, was inefficient to prevent rickets, whilst the addition of ¾ per cent. and 1¾ per cent. limestone (Ca : P ratios 1 : 1·4 and 1·2 : 1) gave normal growth, which was not further improved by the addition of 0·5 per cent. codliver oil.

For a general survey of the present state of knowledge on the rôle of minerals in pig-feeding reference may be made to Sheehy's review (Ref. 45).

Iodine. The experimental evidence on the advantage or otherwise of additions of minute amounts of iodine compounds to rations in ordinary feeding practice continues to be very conflicting, and suggestive of regional variations. Some workers seem invariably to get positive effects, whilst others just as consistently fail to detect any response. It would appear, therefore, that the results obtained at any one centre may have only a very uncertain application elsewhere.

From the Pennsylvania State College comes a report (Ref. 56) of extensive experiments designed to test the value of iodine for livestock under the ordinary farm feeding routine of Central Pennsylvania. In the tests with cows the average daily dose of iodine was 1·2 gm., individual cows being found to vary in their ability to tolerate iodine from 0·65 gm. to 2·13 gm. per day. The experiments with cows were primarily directed to ascertain the effect, if any, of iodine feeding upon the incidence of abortion in the herd, and the results were entirely negative. The milk and cream produced during heavy iodine feeding had an objectionable odour and contained very large quantities of iodine.

In calf-feeding experiments iodine (as iodized linseed meal) was fed in quantities ranging from 10 mg. to 23·5 mg. per head daily, the limit of tolerance proving to be well under 30 mg. per 100 lb. live weight. The calves that received iodine ate less hay and made appreciably less gain in weight, but greater gain in height, on the average, than did those receiving no iodine. Similarly in the tests with growing pigs, and with lambs, no certain beneficial results in rate of growth followed from the use of iodine. In the tests with White Leghorn chicks also no certain effect of the iodine on the growth, mortality, or egg-laying of the birds, could be detected.

With these American experiments may be compared a series of European reports. Of special interest amongst these is an experiment carried out with cows in a goitrous area of Württemberg (Ref. 57). Samples of hay produced in this region were found to contain only ·033–·169 mg. of iodine per kilo, as against ·311–·543 mg. for hay from the Baltic coast.

Cows of two stalls were divided into three lots (21 cows, 14 goitrous) and given (a) no salt, (b) iodine-free salt, and (c) 100 gm. daily of iodized salt, containing 2·84 mg. of potassium iodine per kilo. The use of iodized salt was found to raise the iodine-content of the milk, but to have no effect upon the milk-yield.

On the other hand the work of Weiser and his colleagues in Hungary has consistently shown favourable responses to iodine feeding with different classes of animals, and a much higher degree of tolerance to iodine than is commonly assumed. A recent report from this source (Ref. 58) gives particulars of a test with 474 merino sheep in a district very low in iodine supply. The herd was divided into two groups, one normally fed and the other given also 4–40 mg. iodine per head daily, and observed through three generations. There were no harmful effects, weaning weight of lambs was higher in the iodine group, and wool-yield was increased by 10·6 per cent.

In another report from the same source (Ref. 59) experiments on the degree of tolerance of pigs to iodine are dealt with. Pregnant Middle White sows consumed as much as 0·3 mg. of iodine per 1 kilo. live-weight in the course of the period of gestation without apparent ill-effects, either on gestation or farrowing. During the suckling period of 77 days a further average quantity of 0·5 mg. iodine per 1 kg. live-weight was consumed. In addition the food consumed by the young pigs from the third week onwards to weaning supplied 0·43 mg. iodine per 1 kg. live-weight. Subsequent to weaning the pigs were fattened for a period of 85–97 days until they reached the live-weight of 75 kg. (165 lb.). During this period the average daily consumption of iodine per head was 38·7 mg. or 0·6 to 0·8 mg. iodine per 1 kg. live-weight. The average rate of gain in live-weight throughout was quite satisfactory. In summing up the results the claim is made that so far from the relatively large amounts of iodine consumed having been in any way injurious to gestation, suckling or growth, they have on the contrary exercised a favourable influence on the development of young pigs; but as no "controls" were included in the tests this conclusion can be no more than an expression of opinion.

From other experiments with hens on two large poultry farms in Hungary (Ref. 60) the claim is made that iodine feeding (1 mg. iodine per 1 kg. live-weight) led to increased egg-yield, higher fertility and improved hatchability. Earlier and quicker moulting is also claimed in favour of the iodine feeding. Against this may be placed the observations of Schmidt (Ref. 61) who was unable to trace any effect upon rate of growth, period of moult, or the number and size of eggs produced. The one fact that comes out clearly and consistently from all the poultry work is the passage of iodine into the egg, especially into the yolk. Such eggs are said to have an enhanced keeping quality, and may perhaps have some advantage in assuring an adequate iodine supply in human dietary.

X.—ENERGY CRITERIA OF FOOD VALUES.

The assessment of the values of foods on the basis of the amounts of energy that the animal can derive from them has long been the standard practice of the nutrition adviser, and is exemplified most commonly in the "nett energy values" of Armsby and the corresponding "starch equivalents" of Kellner. In the early days of the use of energy standards the energy conception was applied far too rigidly, and often with a fine disregard of patent discrepancies with the facts as established by practical experience. The steady unfolding by modern research of the great complexity of the nutritive processes has led, however, to a much clearer conception of the possibilities and limitations of the expression of food values in terms of energy, and has forced upon us the realisation that the "nett energy values" or "starch equivalents" that we use as measures of the nutritive values of our foodstuffs can at best be no more than rough average measures of these values; and even that only in so far as the rations in which the foodstuffs are embodied supply in sufficiency every other factor (*e.g.*, vitamins, minerals, etc.) that are essential for the effective liberation and utilization of the nutrient energy. Forbes (Ref. 62) who has done so much work in this field at the Pennsylvania Station, would indeed go further, and asserts that "there is no present, or possible, scientifically significant and defensible single measure of nutritive value of individual feeding stuffs; and that in order to place our interest in such a measure on to a rational basis it is necessary to revise the terms of the interest itself, and to base it on *rations as wholes* rather than upon individual feeding stuffs".

Be that as it may, it is clearly improbable that any feeding-stuff, or mixture of feeding-stuffs, will have the same value under all conditions, so that any one figure assumed as a measure of such value can only be valid for one set of conditions; for practical rationing purposes it will usually be convenient to have the figure that corresponds to the *average* conditions of practice.

Of the many factors that may influence the degree of utilization of the energy of a food or ration the quantity consumed is one of the most obvious, and has been the subject of many experiments, some of which have been reviewed in past Reports. A further contribution that may be noted here comes from Mitchell and his colleagues at the Illinois Experiment Station (Ref. 63). In these experiments the utilization by a two-year-old Shorthorn steer of the energy of a ration of 73·1 per cent. of maize, 24·1 per cent. lucerne hay, 2 per cent. linseed meal and 0·8 per cent. molasses, has been investigated at six levels of supply, ranging from fasting to full feed.

The digestibility of the ration tended to fall somewhat as the amount fed was raised, especially as regards carbohydrates and oil, and hence the energy obtained by the animal per kilogram of dry matter fell from 3,094 Calories at the lowest, to 2,661 Calories at the highest level of feeding, or 70·1 per cent. and 60·6 per cent. respectively of the gross energy of the ration. This difference disappears, however, when the utilizable energy is calculated per kilogram of *digestible* nutrients. Of the many interesting data obtained in these experiments only a few can be quoted here. Thus, the "nett energy" values per kilogram of dry matter consumed steadily fell with the increasing food consumption from 2,957 Cal. on the heaviest, to 1,842 Cal. on the lightest ration. The percentage availability of the utilizable energy worked out as follows from the lowest to the highest levels of feeding:—95·6, 77·7, 75·2, 73·8, 69·3. It will be noted that the greatest changes were at the two extremes, and that for the three intermediate levels of feeding (two-fifths to four-fifths of full feed) which cover all but the heaviest feeding of farm practice, the change in availability, and therefore in "nett energy" is but small (73·8–77·7). The average heat production of the fasting steer, when reduced to standard conditions, came out at 1,858 Cal. per square metre of body surface, this representing in terms of energy the minimum maintenance requirement of the animal. The average of 13 determinations of the fasting heat production of beef cattle, corrected to the standard day, from the Illinois and Pennsylvania experiments is 1,897±19 Cal. per square metre of body surface.

Similar, but less precise and more "practical," experiments with pigs have also been reported by the U.S. Department of Agriculture (Ref. 64). In these three sets of experiments the pigs were fed at three levels: full-fed, three-fourths, and one-half-full-fed. All the pigs were individually fed, and body analyses were made at the end of the experiment. The results showed a decrease in the rate of gain with a decreased food allowance, but at the same time a corresponding decrease in the feed requirement per 1 lb. of live-weight gain. Although the most restricted lot required a 40 per cent. longer feeding period than the full-fed lot it produced 33 per cent. more pork from an equal amount of food. One hundred pounds of feed produced gains of 24, 29 and 32 lb. when fed at 4, 3 and 2 lb. levels per 100 lb. live-weight of pigs.

The carcase analyses showed increased yields of ham and trimmed loins, and a decrease in the yields of belly and total fat (back fat and trimmings) on the lower feed levels. In the last experiment the percentages of fat in the entire carcase for full, three-fourths and one-half levels of feeding were 35·7, 34·3 and 28·7 per cent. respectively. Limited feeding resulted, however, in a decreased firmness of the carcase and softer fat.

Just as the "nett energy value" of a feeding stuff may vary with the amount fed, so also it is possible that it may vary according to the nature of the ration in which it is included. On this point further information is now available from the work of Forbes and his colleagues in the Institute of Animal Nutrition of Pennsylvania State College. In the experiments now reported determinations were made of the "nett energy value" of maize meal when fed to cattle as an addition to three basal rations that differed widely as to protein, mineral and vitamin contents; and therefore presumably differed in their capacities to supplement maize meal. The apparent digestibility of the maize meal was found to be affected decidedly by the other constituent feeding stuffs of the rations in which it was fed, and this factor therefore affected the "nett energy values" determined. The total utilizable (metabolizable) energy of the maize meal, fed on a production level, ranged from 2,946 to 3,339 Cal. per kilogram of dry matter in the case of one animal, and from 2,944 to 3,387 Cal. in the case of the other, according to the rations in which the maize meal was fed. Similarly the "nett energy value" of the maize showed a range from 1,645 to 2,518 Cal. according to the ration. Since the plane of nutrition was essentially the same with each ration these differences must obviously represent different associative effects of the feeding-stuffs used in the ration.

These results tend to support the conclusion of Forbes quoted above that the characteristic "nett energy values" of feeding stuffs can only be realized when they are components of rations that are nutritively complete, in the sense that every essential factor is present in optimum proportions. It would not seem possible to get more than a rough evaluation of any individual feeding stuff apart from the ration in which it is used.

Another factor which may conceivably affect the utilization of feeding stuffs is the size of animal to which it is fed. The "surface law" according to which the basic maintenance energy requirements of the animal vary in proportion to the extent of body surface exposed is familiar to the agricultural student. From this "law" the conclusion has frequently been drawn that large animals should utilize food more economically than small animals. From a recent review of this question (Ref. 66) it would appear, however, that this deduction is not valid as a generalization. It can be shown, indeed, that so far as economy of utilization of food is concerned there may be far greater individual differences between animals of the same size and race, than between small and large animals of different kinds.

A further report from the Pennsylvania Institute (Ref. 65) deals with the economy of conversion of food energy into milk energy by the dairy cow. In these tests nine Friesian cows were fed for a whole year on a standard ration of hay (1 per cent. of live-weight), maize silage (3 per cent. of live-weight), and grain mixture (1 lb. per 3½ lb. milk). The most efficient cow converted 23·35 per cent. of feed energy into milk energy during one period of lactation, and the least efficient cow 18·04 per cent., with an average of 20·96 per cent. for the nine. The average period of lactation was 313 days, and if the feed consumption for the dry period of 52 days be included, then for the whole 365 days 18·68 per cent. of the feed energy was on the average converted into milk energy.

Much of interest bearing upon the energy requirements of animals under different conditions is also contained in the further work of Brody and his colleagues at the Missouri Experimental Station (Ref. 67), as to which readers interested must be referred to the original reports.

XI.—Milk Production Problems.

The question of protein requirements for milk production has been dealt with in an earlier section, but other matters of interest remain to be noted.

Food Fat and Milk Fat.

It is a matter of common experience that within the limits commonly met with in good dairy practice variations in the fat-content of the ration have little influence upon the fat-content of the milk. That there is a minimum fat supply below which deficiency of food-fat may cause an appreciable lowering of the fat-content of the milk was demonstrated some 30 years ago at Hohenheim, and finds confirmation in recent experiments at the Cornell Station (Ref. 68). When the fat in the concentrated portion of the ration was reduced from 7 per cent. to 1 per cent. large decreases occurred in milk yield and fat yield. Even at 3 per cent. the decreases were still significant. From the practical standpoint the data are regarded as indicating that maximum milk secretion is favoured by a fat intake sufficient to provide the major part of the fat secreted in the milk. On the other hand it is known that an excess of certain oils in the food (*e.g.* codliver oil) may lead to a lowering of fat percentage in the milk.

High Roughage v. Low Roughage.

Systems of feeding the dairy cow fall broadly into two classes ; in the one relatively large proportions of coarse fodders (and roots) are used along with comparatively small amounts of concentrates, whilst in the other class the proportion of roughage is much less and of concentrates correspondingly higher. In recent years, through the growing insistence on " control of bulk " as a factor in successful management, the latter class of ration has been favoured, and it is of interest therefore to have the results of a 3½ years comparison of the two systems which has been carried out at the Massachusetts Experiment Station (Ref. 69). In these tests the high roughage group of cows was fed concentrates at the rate of 1 lb. for each 4½ lb. milk, 35 lb. of silage, and as much hay as they would clean up. The low roughage group received concentrates at the rate of 1 lb. for each 2½ lb. milk, along with silage and hay as for the other group. In general the cows of the low roughage group looked better, put on slightly more weight, milked more freely and more regularly from year to year and had a better reproductive record. They consumed rather more food but required 7 per cent. less dry matter and 2·7 per cent. less digestible nutrients to produce 100 lb. of milk.

Specific Influence of Palm Kernel and Coconut on Fat Secretion.

Opinion has always been sharply divided as to the possibility of affecting the fat-content of milk by variation of the nature of the ration, although the general weight of experimental evidence is strongly against any such possibility where rations that may be regarded as normal and suited to the needs of the cow are used. To this generalization it may be necessary, however, to make individual exceptions, and this would appear to be the case with palm kernel and coconut foods. That an appreciable increase in the fat-content of the milk could be obtained under certain conditions by the use of these foods was established more than 20 years ago by extensive cooperative experiments both in Germany and in Denmark, and confirmatory results have subsequently been published from time to time. Interest in the subject has revived recently and a number of reports of experiments on this point have been issued during the past year and may be briefly reviewed.

In experiments at Göttingen (Ref. 70) with 18 cows a mixture of palm kernel and coconut cakes in equal parts was used, and fed in different periods at the rate of 3·3 lb., 6·6 lb., and 9·9 lb. per head daily. In the control periods the above were replaced by an equivalent mixture of decorticated groundnut cake, soya meal and dried beet pulp. With the 3·3 lb. allowance of the mixed palm kernel and coconut cakes the amount and percentage of butter fat was raised by 10 per cent.; with the 6·6 lb. allowance the fat-content of the milk was raised by 16 per cent., and the total weight of fat by only 10 per cent., the yield of milk being slightly reduced. Further increase of the allowance to 9·9 lb. proved more detrimental than advantageous, the amount fed being clearly excessive in relation to the milk yield. The remark is made that "in all the tests very marked differences were shown in the reactions of individual cows to the palm kernel—coconut feeding".

In another German experiment (Ref. 71) with seven cows receiving from 4·6 lb. to 8·6 lb. of palm kernel cake per head per day, along with other concentrates, the percentage fat-content of the milk was raised on the average by 0·4, the actual improvement being apparently determined more by the individuality of the cow than by the amount of palm kernel cake fed. The milk yield was apparently unaffected.

Further German experiments (Ref. 72) showed that whilst oil-extracted coconut and palm kernel meals were without influence on the fat content of milk, the use of cakes containing 5 per cent. or more of oil raised the production of butter-fat, the effect tending to increase as the oil-content of the cakes rose. Ordinary commercial coconut and palm kernel cakes of medium fat content (6·7 per cent.) raised the percentage of fat in the milk by about 0·22 and total daily fat by about 38 gm. With cakes very rich in oil (11·5–29·6 per cent.) the results were more variable, but the percentage of butterfat was raised by 0·34–0·55, and the daily fat output by 55–77 gm. Here again it is reported that the response of individual cows to the coconut and palm kernel cake feeding was very variable.

Against these favourable German reports is the experience of the Iowa Experiment Station (Ref. 73) in a test with coconut meal, in which no apparent effect upon the content or amount of butter fat could be detected.

In all these cases the small scale of operations and the great individual variations raise serious doubts as to the validity of the conclusions drawn, and they can only be considered in relation to the more extensive older experiments in which the evidence of specific promotion of fat secretion by these two foods seemed to be unquestionable.

Water Supply.

In *Agricultural Research in* 1930 (p. 135) we gave the results of experiments with water bowls at the Iowa Experiment Station, in which results definitely favourable to the use of the automatic bowls were obtained. A report (Ref. 73) on further experiments at the same station is now available, giving evidence confirmatory of the earlier results. When drinking bowls were used the cows drank about 18 per cent. more water and produced 3·5 per cent. more milk, and 10·7 per cent. more butter fat than when watered twice daily at an outside tank. These differences appeared to be statistically significant. The cows drank about ten times daily from the bowls, consuming about two-thirds of this water between 5 a.m. and 5 p.m. Individual cows varied greatly in water consumption, but there was no consistent correlation between an inclination to drink and the quantity of milk yielded. The temperature of the water did not influence its consumption so much as did atmospheric temperature.

XII.—INDIVIDUAL FEEDING STUFFS.

Marrow-Stem Kale.

This forage crop is apparently growing in favour on the Continent and is the subject of several reports. In comprehensive tests made by the Swedish Central Experiment Station (Ref. 74) the composition and digestibility of the green crop at different stages of growth, and of silage made from it, have been studied. The range of variation of composition of the green crop (including certain Finnish data quoted) is summarized below :—

Dry Matter	13·8–14·8	per cent.
Organic Matter	11·7–12·8	„ „
Ash	1·4– 2·3	„ „

	Per cent. of Organic Substance.
Crude Protein	14·0–15·5
(True Protein)	(10·1–12·2)
(Digestible Protein)	(6·4–8·8)
Ether Extract	3·3–4·0
Nitrogen-free Extractives	60·6–67·6
Fibre	14·6–21·4
Ash (in dry matter)	10·5–18·9

The digestibility of the organic matter ranged from 75 to 87 per cent., its starch equivalent from 63 to 70 per cent., with a doubtful figure of 80 per cent. from the Finnish trials. Thinning out the plants tends to improve the quality of the crop by giving thicker stems with a higher proportion of "marrow" to "rind". Large amounts of marrow-stem kale (110–132 lb. per day) fed to dairy cows produced a butter-fat of excellent consistency, superior to that from aftermath clover. Conflicting views have been held as to the effect of feeding the kale on the flavour of milk, but in Danish trials, in which as much as 120 lb. of kale per cow daily was fed, no undesirable flavour could be detected in the milk.

German experiments (Ref. 75, 76, 77) gave results substantially in accord with the above, especially as to the comparative richness of marrow-stem kale in protein. In one experiment (Ref. 76) the feeding of 132 lb. of the kale per head per day to milch cows gave a rather "strong" flavour to the milk, but this was not the case when the amount was restricted to about 90 lb. per day.

Sugar Beet Tops.

In the current issue of the *Journal of the Royal Agricultural Society* a full report is given by Rayns (Ref. 78) of the four years' experimental work on the feeding of sugar beet tops (leaves and crowns) to fattening bullocks carried out at the Norfolk Agricultural Station. Four comparisons were made of beet tops with theoretically equivalent quantities of swedes, a total of 79 animals being involved. On rations calculated to produce 2 lb. live-weight increase per day the beet tops did not equal the swedes, the difference being "significant" in three tests out of the four. A subsidiary trial showed that the deficiency could be compensated for by feeding an additional 1½ lb. of maize meal daily to each animal. The bullocks received beet tops on the average for 80 days, after which they were finished on mangolds. On this system the bullocks made larger gains during the mangold feeding period than those which had been fed continuously on mangolds, but did not quite recover the whole of the lost ground. The tendency of beet tops to cause scouring was checked by the supply of 2 oz. of feeding chalk per head daily. The ratios of dead to live-weights were identical, and no differences in carcase quality could be noted. From the data of these trials it is estimated that one ton of beet tops was equal to 0·93 ton of swedes or 0·13 ton of dried beet pulp.

Dried Beet Pulp.

This material is essentially a carbohydrate-supplying food, and hence should be useful either as a supplementary food on well-grazed pasture in the summer, or as a partial substitute for starchy foods in indoor feeding. That it can be so used effectively is demonstrated by the results of German experiments with dairy cows (Ref. 79) and with pigs (Ref. 80). In the former it was found that milk production was just as good on half pasture plus dried beets (soaked) as on full pasture, whilst in the latter it was found that one-half of the allowance of potatoes to fattening pigs could be replaced by dried beet pulp.

Dried Apple Pomace.

A contribution to the scanty information on the feeding value of this by-product of cider manufacture comes from the Washington College Station (Ref. 81). In earlier tests with dairy cows apple pomace had been found rather more palatable than beet pulp and almost equal to it for milk production. This has been confirmed by the later experiments, in which the dry matter of the pomace was found to be 72 per cent. digestible. When soaked for from 2 to 12 hours in 2½ times its own weight of water it could be fed at the rate of 3 lb. of soaked pomace per 100 lb. of live-weight. Milk production was approximately 6½ per cent. less on dried pomace than on dried beet pulp. The pomace did not affect either the flavour or the odour of the milk.

Fish Meals.

The increased urgency in all countries of using home products to the fullest extent has developed an increased interest in fish meal in countries where the fishing industry is of importance.

This has led in Germany to the issue of a monograph (Ref. 82) prepared by the Feeding Experiments Committee of the German Union of Agricultural Experiment Stations. Apart from the review of existing knowledge the monograph includes reports of new experimental work, including digestion trials with 8 different types of meal, examinations for vitamins A, B, and D, and practical feeding tests of the tolerance of pigs to salt.

The content of vitamins A and D was found to vary greatly according to the nature of the raw material and the method of manufacture. Only about one-third of the samples tested proved to have anti-rachitic properties. All the meals contained vitamin B in small amount.

Fish meals with a salt content up to 20 per cent., when fed in the proportions usual in pig rations, did not produce any disturbance of either the rate of growth or health of the animals. High doses of salt did, however, cause excessive consumption of water. The limit beyond which the feeding of salt to pigs would appear to be risky is fixed at 2 gm. daily per 1 kilo. live-weight, or 100 gm. (roughly 3½ oz.) per day for a pig weighing 50 kilo (110 lb.).

The experiments on fish meals at the Cornell Station referred to in last year's Report (p. 109) have been continued (Ref. 83) and have confirmed the previous conclusions as to the variability in vitamin content and protein efficiency of fish meals dried in different ways. Vacuum-dried meal was superior in both respects to steam-dried meal, and the latter to flame-dried meal.

Similar conclusions as to the influence of the method of manufacture, and of the raw materials used, have also been obtained by British workers (Ref. 84), who also make the statement that "commercial fish meal, and especially that prepared by the rotary-dryer method, contains highly oxidized oils which cause disturbance during the periods of reproduction and lactation". These experiments showed also that the removal of oil from fish meal prepared by drying under conditions which prevent oxidation does not affect the property (anti-rachitic) of the meal in aiding the calcification of the bones.

Flaked Maize.

This product, which is made by steaming and rolling maize, has attained a great popularity in recent years, but has not yet received much attention at the hands of experimenters. Two reports to hand this year are therefore of special interest. The more extensive of these (Ref. 85) deals with Danish pig feeding experiments, including in all 42 groups of 10 each, in which the feeding value of flaked maize was compared with that of maize meal. The flakes were prepared by steaming and rolling without extraction of oil. The general conclusion is drawn that 0·90 lb. of maize flakes gave as good results as 1·0 lb. of maize meal, and it is calculated that 0·8 kg. of maize flakes is equal to one Danish feed unit. Quality of carcase was equally good with both forms of maize.

In the other report (Ref. 51) a brief account is given of a similar comparison at the Harper Adams Experimental Station with two lots of 15 pigs each. In this case no superiority of the flaked maize was indicated, the records of the two groups being practically identical. The general conclusion is drawn from this test that whilst flaked maize may have some advantage as regards influence on bacon quality (from previous experiments), and palatability for young pigs, the economy of its use for older animals is doubtful.

Similarly, in comparisons with pullets and hens at the National Institute of Poultry Husbandry (Ref. 86), flaked maize did not prove in any way superior to maize meal. Clearly, however, in the light of the Danish results further tests are desirable.

Oats for Pigs.

The frequent necessity for the utilization of home-grown grain makes it almost inevitable that oats, despite their high fibre content, must often be included in pig-feeding rations. Practical opinion as to the merits of oats for this purpose varies greatly, but from recent experiments it would appear clear that the efficiency of utilization of this food by the pig depends upon the fineness of grinding and the stage of development of the animal.

From an experiment at the Harper Adams College (Ref. 87) Wright concludes that oats for pigs should be ground as finely as possible, especially for young pigs. For pigs of five months and upwards fineness of grinding is of less consequence. He would prefer indeed to exclude oats entirely from rations for pigs under 16 weeks old, and at no period would he include more than 25 per cent. in the ration.

Blissett (Ref. 88), from experiments at the Rowett Research Institute, draws conclusions similar in general character to the above but less severe upon the oat. His data indicate that crushed oats may be included in the rations of young pigs up to 30 per cent. of the ration, and that after the pigs attain the weight of about 100 lb. the proportion may be raised as high as 70 per cent. without apparent loss of effectiveness. Oats ground to the fineness of Sussex ground oats were also included successfully up to 70 per cent. in the rations of young pigs under 100 lb., but at an uneconomic cost.

Separated Milk.

Among the many experiments dealing with this product one may be singled out as of special interest. In this experiment carried out at the Agricultural College of Norway (Ref. 89) with 73 pigs, whole milk was compared with separated milk to which a quantity of tapioca flour was added calculated to be equivalent to the fat of the milk, on the Kellner basis that 2·4 parts of digestible starch will be equivalent in productive value to 1 part of digestible fat. The results showed that in pig feeding fat, even in the form of milk fat, does not realize this value, and that probably a ratio of 2·1 : 1 would be more accurate in this case. Furthermore the results suggest that whole milk, instead of being twice as valuable as separated milk, as is laid down in the Scandinavian table of food values, which is based upon the older experiments and commonly accepted, is only about 1½ times as valuable. The use of tapioca flour with separated milk, as a substitute for the removed milk fat in the proportions indicated above, apparently proved very satisfactory, and quite equal to a mixture of soya oil and codliver oil used in the same way.

Whey.

On the feeding of whey to pigs new German experiments (Ref. 90) indicate that with pigs of 165 to 220 lb. live-weight the whey is used to best advantage when about 2 to 3½ gallons per head is fed daily along with about 3½ to 4 lb. of a suitable meal mixture, which in this case consisted of equal parts of rye meal, barley meal and dried potato flakes. Whey should not be fed in large amounts to pigs under about 90 lb. live-weight. Three weeks before slaughter the whey allowance should be reduced and replaced by an equivalent amount of meal. The larger pigs were found able to take surprisingly large quantities of whey, even up to nearly 7 gallons per day.

In an experiment at the Harper Adams College (Ref. 51) with groups of 15 pigs each, dried whey was compared against an equal weight of maize meal, the two groups giving practically identical results. There was thus no indication of the possession by the whey of any specific virtue beyond what its content of proteins, fats and carbohydrates would lead one to anticipate.

XIII.—Miscellaneous Feeding Experiments.

Cattle.

A report has been issued from the Edinburgh and East of Scotland College of Agriculture (Ref. 91) on cattle feeding experiments carried out in the years 1925 to 1930, from which a few points of interest may be extracted.

Comparison of high and low protein diets for fattening 8 cwt. bullocks showed that a ration of oats, barley and bran with a wide ratio of starch equivalent to protein equivalent (8 : 1) gave as good results as a ration containing in addition protein-rich cakes with a narrow ratio (4·7 : 1), provided that adequate amounts of roots were fed.

Studies on the value of potatoes for cattle feeding showed that 30 lb. potatoes gave a better return in a mixed ration than the analytically equivalent 85 lb. swedes, while a mixture of 10 lb. potatoes and 45 lb. swedes gave slightly better results than potatoes alone.

Sheep.

For the rationing of sheep we are mainly dependent in this country upon the standards worked out by the late

Professor Wood. From a critical survey of existing experimental data Watson and his colleagues at Oxford have arrived at the conclusion that Wood's standards for average dry matter consumption are substantially too high, and this conclusion they have now implemented with fresh experimental data (Ref. 92). Three lots of tegs, of different types, housed in an open-fronted shed, were fed successively on four different combinations of food, two of which included roots. Careful records were kept of total food consumption and rate of growth.

The consumption in each lot was considerably below the Wood standards, the actual figures being respectively 67, 78 and 82 per cent. of the expectations; or 2·3 lb., 2·7 lb. and 2·8 lb. dry matter per 100 lb. live-weight per day, as against Wood's standard of 3·43 lb. The highest values, obtained with a wide selection of dry foods, were of the order of 85–90 per cent. of the expectations based on Wood's standards. With the standard American type of ration (maize and clover hay) and a common type of British ration (roots and hay *ad lib.* with limited concentrates) the consumption fell to below three-quarters (72·5 per cent.) of the expectation based on Wood's standards.

It is suggested that true curves for normal dry-matter consumption should be based upon a figure of 3 lb. per 100 lb. live-weight per day when the ration consists mainly of air-dried foods of high palatability, fed in reasonable variety, and *ad lib.*; and that the normal consumption on the typical British ration is about 2·6 lb. per 100 lb. live-weight per day. Under circumstances which are only partly understood the consumption may fall, however, considerably below these "normals". It is interesting to note that the appetite of two of the three lots used in this experiment did not increase to any considerable extent during the feeding period of 134 days, in which the live-weight increased by about 70 per cent.

Pigs.

Reference has already been made in the preceding section to the Danish experiments with flaked maize. In another report from the same source (Ref. 93) various other pig-feeding experiments are summarized.

No significant difference was found between the results of feeding cereals wet or dry in a ration of cereals and separated milk.

In a further experiment with groups of 10 pigs in which various protein concentrates were added to a basal ration of barley, wheat and maize (mixed with water) the following average results were obtained :—

Food.	Average Daily Live-weight Gain. lb.	Food consumed per 1 lb. L.-w.G. lb.
Basal only	0·56	5·97
„ Separated Milk ...	1·26	3·86
„ Soya Meal	0·90	4·03
„ Blood Meal and Meat and Bone Meal ...	0·95	3·88
„ Blood Meal and Dried Yeast	0·90	4·13

Additional groups on the basal ration alone, or basal with soya meal, received supplements of chalk, chalk and salt, or chalk, salt and bone meal, but no improvement of the results was effected thereby.

In two further series of experiments each with five groups of 10 pigs, a ration was fed containing for four groups about 20 parts separated milk, and for the fifth group about one-third of this amount. The basal meal mixture fed with the milk to the control lots consisted of barley, wheat and maize, but in the experimental lots this was replaced to different degrees by tapioca meal with soya meal, blood meal and meat and bone meal. In the first series there was no great difference in the growth or health of the groups, except in the "low milk, high tapioca" group, where one pig died and another showed paralytic symptoms. In the second series the rate of growth decreased and feed consumption per pound of gain increased with increase in the proportion of tapioca fed. Paralysis of the hind quarters occurred in the three groups receiving over 30 per cent. of tapioca, and in the group with little milk only one pig reached slaughter weight. No explanation could be found for these disquieting phenomena, which, from the reviewer's extensive experience with this food must be regarded as definitely abnormal.

Fineness of Grinding.

Two American reports deal with this subject. The first (Ref. 94) deals with the feeding of barley and maize to pigs and cattle. In the case of barley fed to pigs it made little difference to the rate of gain or feed required per 100 lb. gain whether the barley was fed mealy, gritty or merely cracked, although all these forms proved superior to whole barley.

In the case of maize fed dry to pigs indoors whole maize gave the best results in economy of gain. Maize ground to fine meal proved less economical than when in the gritty or granular form, and this in turn less economical than more coarsely ground maize. When fed to pigs on pasture the gritty form gave slightly better results than the other degrees of fineness, but distinctly inferior to those given with whole maize.

In two winter and two summer experiments with dairy cows, the animals put on weight rather faster with coarse barley meal than with fine meal, but there was practically no difference in milk yields.

In similar tests at the Pennsylvania State College (Ref. 95) the effect of grinding maize was determined with pigs fed on a ration containing over 70 per cent. of maize. The maize was fed in three different grades of fineness ranging from fine meal to coarse grist. Whole maize was fed to a fourth lot in each case. No significant differences were found between the various degrees of grinding, but in contrast to the Wisconsin observations all were superior to unground maize. The meal of intermediate fineness was slightly better than the coarsest grist. and in terms of cost the most economical form. At both centres dry feeding methods were followed and the conclusions do not necessarily apply to slop feeding.

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FARM IMPLEMENTS AND MACHINERY.

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I.—Power Farming.

The increased application of power to Agriculture in Great Britain, to which attention was drawn in the last volume of the *Farmer's Guide*, is steadily proceeding. A very complete survey of recent developments has been given by Newman (Ref. 1) in a paper which opens by pointing out that mechanized methods lead not only to cheaper farming but also to better farming. He goes on to consider the more striking features of a number of different farms which together embrace a very wide range of crops.

Several more detailed accounts of the working of individual mechanized farms have also been published. From these it is evident that, apart from the replacement of the horse by the tractor, which is a feature of all power farming, there are two distinct lines along which development is taking place. In the first certain labour-saving methods and machines are adopted *en bloc* from abroad. The farm has, as far as possible, to be chosen to suit them while, since expensive machines and a minimum of labour are used, the rotation must be modified so as to include only such operations and crops as they can deal with. In effect the machine controls the whole system and everything else must meet its demands.

Messrs. Alley's farm in Norfolk, of which a description is given by Robinson (Ref. 2), is a striking instance of this type of development. The farm extends to about 1,000 acres of arable land and is worked on a simple rotation in which two cereal crops are followed by a bare fallow. Three tractors, each of about 20 drawbar horsepower, are used to pull the widest procurable cultivating implements, while harvesting is done by two combines. Only four farm hands are regularly employed, and it is claimed that the overall costs of cereal production have been reduced to less than £5 per acre for a four-quarter crop. There are, perhaps, ten farms operating in this country more or less on the above lines, and under the stimulus of the Wheat Quota it is likely that their number will increase in the near future.

The second kind of development follows more closely the lines along which our agricultural system has been evolved in the past. Here the tendency is to invent new devices to fit existing conditions, rather than to try and find conditions which will fit existing machines. This type of power farming is well exemplified by Mr. Hosier's farm, which is discussed in an article by Orwin (Ref. 3). The system of open-air milking developed on this farm is too well-known to require further description here. It may, however, be worth while to point out that the tremendous saving of labour which the method achieves does not result simply from using more machinery. On the contrary, the capital expenditure on machinery is probably less than that of any other mechanically-milked herd. The essence of the method is in fact to have as few appliances as possible, but to have them in the right place. The article describes many other developments, including an extension of the large scale open-air method to egg production, and some ingenious methods of making hay and silage.

When the systems practised on this farm are compared with other methods more generally used, two criticisms are often made. First that they require to be practised on a scale too large for the average British farm, and second that this particular farm is specially well suited to their application. The first criticism is perhaps due to too much prominence being given, not only by Orwin in the article referred to, but by other writers on the same subject, to the fact that on the Wexcombe farm each milking unit of 60 cows and each poultry unit of 4,000 hens is run quite separately from the others and from the arable land. Naturally enough, if a particular unit is just large enough to occupy the full time of one team of workers—in this case one man and a boy—the maximum efficiency will result if they confine their whole attention to that unit. But it is not fair to conclude that at least 60 cows or 4,000 hens are necessary before the general principles can be followed. If, for example, a farm would only carry 30 cows one team could, without serious loss of efficiency, work them on the same lines in conjunction with say 2,000 head of poultry or with some other enterprise. The second criticism can best be answered by quoting the inventor's own words from a contribution to a recent discussion (Ref. 4a):—" . . . to-day people tell me that Wexcombe is ideally adapted for my job. I know it is, but I adapted it."

Adaptation of method is further illustrated by an account of another grassland farm by Skilbeck (Ref. 5). In this case, while the general scheme is based on that already described, the farmer has not hesitated to modify certain details to meet his own requirements. This farm is the more interesting in that both pigs and grassland sheep are kept.

Mechanization of a quite different type is dealt with by Bomford (Ref. 4a) in a paper describing a farm which includes some 200 acres of market garden crops. He opens with a discussion of the considerations which ought to influence a farmer in deciding whether to take advantage of a new development in machinery. The first consideration mentioned is particularly interesting, namely, that "a machine is rarely worth buying unless it does its work at least as well as it has been done by other means; that is to say, a saving in labour and time will not often justify a decrease in output per acre or in the quality of the product". From the point of view of the market gardener with his generally more valuable crops, all of which incidentally are grown for sale, this conclusion is perhaps sound, but it is to be doubted whether all mechanized farmers will entirely agree. Denham (Ref. 4a) for example, discussing the basic problems of mechanization, points out that, just as it has long been recognized that there is an economic point for every field and crop for the addition of fertilizers, so it is becoming recognized that there may also be an economic yield. In many cases, particularly in farm crops which are expensive to grow, it may pay to grow a slightly reduced crop at a greatly reduced cost of cultivation. Bomford goes on to draw a distinction between seasonal machinery and machinery which is in constant use. This portion of the paper is summed up as follows:—"This should be the object of choice in machinery; not so much to enable the farmer to dispense with employees as to enable him to be always right on top of his work, to cut out heavy losses in production owing to planting and cultivations that are done too late . . . and to enable him to market at the apparently inevitable low prices with less risk of loss."

Although the four farms which have so far been mentioned differ considerably from one another they do not, even when taken together, cover the requirements of the average mixed farm of the country. In particular, except for grassland sheep in one case, none of them carries any fattening stock and therefore none of them has those bogeys, the dung cart and the root break, to contend with. These problems are considered in relation to mechanization by Watson and Skilbeck (Ref. 6) in a paper which opens by demonstrating that "taking the country as a whole the most important function of our arable land is not to produce marketable grain but to grow winter food for stock". In regard to root crops it is pointed out that in practice little general advance has yet been made in the direction of mechanizing mangolds, swedes and turnips, and that except in certain favoured districts the cost of growing them is likely to continue to be prohibitive. The paper goes on to remark that if a crop is incapable of being dealt with efficiently by mechanical means it becomes essential to replace it by one which can be. It is therefore proposed to replace the more usual root crops by kale and rape, which can be grown without costly singling and, owing to their smothering effect, with less difficult weed control. It is also suggested that the kales could, without great difficulty, be harvested by machinery such as that used abroad for the maize crop. It may perhaps be worth pointing out that since, as the papers mention, kale can only be kept standing, the bulk of the harvesting would have to be done under winter conditions and that it is by no means certain that the maize picker would be as effective in these circumstances.

In the other crops of the rotation on the hypothetical farm considered advantage is to be taken of the combine harvester and of the more recent haymaking appliances. The bulk of the straw is to be trodden into dung and it is suggested that handling difficulties could be materially reduced by careful planning to avoid long cartage and by the use of mechanical manure spreaders. It is concluded that to be economical, the mechanized mixed farm must extend to from 500 to 750 acres and that smaller farms must necessarily be specialized. Some doubt may perhaps be entertained as to the soundness of the argument that since we cannot always do without straw to be trodden into dung we must grow something like 250 acres of cereals so that the combine harvester can be used economically. Again, the newer haymaking implements are not so much more costly than the old ones that the maximum possible acreage of hay must necessarily be grown. It is probable, in fact, that many highly effective developments in power farming are going on unnoticed on some of our smaller mixed farms, and that in the long run it will be possible to reduce considerably the minimum acreages mentioned in this paper.

Developments which may affect the mechanization of the mixed farm are also considered by Miller (Ref. 7) whose paper, referring particularly to Scottish conditions, contains several original proposals. It is suggested, in particular, that the tractor may have a much greater sphere of usefulness than is generally recognized. After reviewing a number of new developments Miller concludes that many methods now being applied in England might well be given a serious trial in Scotland.

II.—HARVESTING.

The work done by combine harvesters in this country during the 1932 harvest is described by Newman (Ref. 4b). Apart from demonstration machines and those taking part in a co-operative harvesting experiment, 20 combine harvesters were at work as against ten such machines in 1931 and four in 1930. The acreages cut averaged almost exactly 200 per machine, but the figures for individual combines varied from 100 to 370 acres. Naturally enough the machines with the greatest acreages to their credit were generally those operated by crews with previous experience of the work, but this was not always the case. Nor, on the other hand, was lack of experience the only reason for the smaller acreages cut by some of the others. Several special features, such as bulk handling of the grain, the relative merits of straight combining and windrowing, and some of the problems of drying are discussed in this paper in the light of the season's working. Windrowing appears to have been used to greater advantage than in former years and it is now considered to be the best method of dealing with long-strawed crops or crops with a heavy undergrowth of greenstuff.

On the whole the paper indicates that the combine harvester performed fairly creditably in a harvest which was drier than the preceding one but which was perhaps more complicated in some districts by badly laid crops. At the same time it is obviously still an open question whether combine harvesting will become our standard method of dealing with cereal crops or whether we shall eventually devise some new method of our own. There is for example an indication in the paper just described that combining loses efficiency when the crop exceeds four quarters or so per acre, unless short stiff-strawed varieties are grown. Again no very convincing account of methods of handling the straw has yet appeared, and, while straw is still a drug on the market, the bulk of opinion inclines to the view that we cannot afford permanently to neglect it. That the same feeling is prevalent in certain parts of America, notably in the Corn Belt, is pointed out in a paper by Hanson (Ref. 8). In these regions it has been possible so far for those who include both stock feeding and combine harvesting in their activities to buy straw from their neighbours more cheaply than they could gather their own. Because a great deal of stationary threshing is still done, straw has been available at about one dollar per ton when it would cost twice as much to collect. It is realized, however, that as the practice of combining spreads it will become imperative to find an efficient method of collecting straw behind the machine and seven different methods at present practised are described in the paper.

Other difficulties which stand in the way of the general adoption of the combine in this country are also experienced in the Corn Belt. In a paper describing the special needs of the region, Mayer (Ref. 9) remarks that small farms and small fields will require smaller sized combines, but that these must not be simply scaled-down editions of the larger models. The variety of crops to be dealt with, the length of the straw, and the presence of long green undergrowth, all demand a machine rather different from the normal type. This paper is specially striking because it always insists on the need for redesigning the machine and does not even mention the perhaps easier alternative of modifying the system of farming. The same spirit pervades a paper by Gray (Ref. 10), which describes the harvesting of soya beans in the lower Mississippi valley. The combine has been so successful in harvesting soya beans in other parts of America that the most persistent efforts are being made to adapt it to the particularly difficult conditions of this district. In both papers, while the particular crops described are sometimes unfamiliar, the difficulties involved are so like our own that many of the conclusions should be of interest to British designers.

While published accounts of harvesting methods are still confined almost entirely to the activities of the combine harvester, there are suggestions by several writers that other less drastic revisions of the expensive procedure of cutting, stooking, stacking and so forth may be almost as effective. That there is considerable scope for such development is shown by Bomford's estimate in the contribution already referred to (Ref. 4a), that the annual overhead charge involved by the combine is sufficient to pay the wages of 14 men during harvest ; and it is to be hoped that in the near future a critical study of other methods of harvesting will be made.

In Canada an alternative known as the "Header-barge" method is receiving a good deal of attention, since in some districts combined grain has been found to heat in the storage bins. The crop is cut with a binder or header and is elevated immediately into a large box barge pulled alongside. The straw is trodden during the process and the load is deposited in compact heaps at intervals. Threshing is done by a stationary thresher which is moved from one heap to the next. According to an account by Mackenzie (Ref. 11) the method is likely to be widely used in the future, since it is nearly as economical as combining and is much less subject to weather risks.

Whatever harvesting methods may eventually be used, it is probable that artificial drying of grain will become increasingly popular. Apprehension has been felt in some quarters as to the possible effects of artificial drying on germination. This point is studied in a paper by Cashmore (Ref. 4c), which describes a short series of germination tests of artificially dried grain: it is shown that germination is unaffected provided that the temperature of the grain does not exceed 140°F.; but that quite short exposure to a higher temperature may be harmful.

An exhaustive study of the drying of wheat has also been published by Stansfield and Cook (Ref. 12). As the result of a very large number of experiments extending over several seasons they conclude that the temperature of the drying air must not exceed 180°F. if germination is not to be impaired. A further conclusion, of the utmost importance to British farmers, is that germination tests are not of great value in indicating whether baking qualities have been impaired.

III.—HAYMAKING.

No other complete agricultural operation has been so fully mechanized as the making of hay. On many farms the crop is not touched by a hand-wielded tool until it eventually reaches the top of the stack. This development, the final stages of which have been almost unnoticed among the more spectacular achievements in other branches of agricultural engineering, is traced in a recent paper by Cashmore and Newman (Ref. 13). From the first "Haymaker" invented about 1814 progress in haymaking machinery went on steadily until about 1875. By that time all the implements in common use in this country before the War had been invented, and for more than forty years the only improvements were in matters of detail.

In the post-war years, with the advent of the tractor, many new methods have been introduced. Power-driven mowers on the one hand and sweeps, loaders, elevators and stackers on the other have altered the whole time-table of haymaking. All these changes are traced in the paper referred to and the possibility of other innovations is discussed. The second part of the paper describes the work done during 1932 by the Combine Haybaler. This machine gathers and bales hay direct from the windrow and worked quite successfully at three different centres. It was found possible to bale hay when the moisture content was too high for it to be stacked. Providing that the bales were stored so as to permit adequate ventilation the hay proved eventually to be of excellent quality. There were, in fact, indications that a higher moisture content at the time of gathering might lead to better quality hay. The main disadvantage of the method was its comparative slowness but, as more experience is gained, the average output of about one ton per hour is likely to be nearly doubled.

We have seen that the tractor has been responsible for most of the recent developments in haymaking methods and it is obvious that the tractor age in British agriculture is only just beginning. Yet, curiously enough, the tractor is already being superseded in the hayfield. Mowing can be done more cheaply and probably more effectively by a mower drawn by a single horse, the cutter bar being driven independently by a small engine ; while the newer form of sweep mounted on the front of an old motor car, gathers the hay more quickly than it has ever been gathered before. These developments are mentioned in the above paper, and are dealt with more fully by Hosier in a contribution already referred to (Ref. 4a). Hay sweeps are generally used in conjunction with the hay stacker, which again can be most efficiently operated by a motor car. An alternative method of lifting sweep loads on to the rick is described by Bomford (Ref. 4a). A portable jib crane with an automatic grab is used and allows the crop of two adjoining fields to be put into one rick if required.

Mention was made in the last volume of the *Farmer's Guide* of a new type of mower introduced in the U.S.A. in which the crop was crushed between rollers immediately after cutting. A further description of the working of the " Mower-crusher " has since been given by Zink (Ref. 14). When lucerne hay is being made the machine offers two advantages. Not only is the drying of the crop accelerated so that weather risks are lessened, but since the rates of drying of leaf and stem are to some extent equalized, there is considerably less loss of leaf. It is stated that with this machine under Eastern Kansas conditions lucerne hay may be dried sufficiently to be stacked on the day that it is cut.

Perhaps the most notable experimental work of recent years in connexion with grassland farming has been that on the nutritive value of short grass. It has been found that by cutting and curing grass at frequent intervals throughout the growing season, a feeding stuff much more concentrated than the best hay may be obtained. The main difficulty in the way of a general adoption of this scheme—that of collecting the crop—has now been overcome by a machine which is described in a recent article (Ref. 15). This machine is a combination of an ordinary mower and an elevator by which the cut material is conveyed straight from the cutter bar into a cart drawn behind. It was originally designed for use with silage crops, but when fitted with a twin finger cutter bar will deal quite successfully with short grass.

The material so collected must, in general, be dried artificially, and the manner in which the new method of using grass eventually affects the farming industry will depend very much on how the problem of artificial drying is solved. If drying can be done effectively with a simple tray dryer it will be possible to produce the new feeding stuff on even a relatively small farm. If, on the other hand, a much more costly apparatus is required, either co-operative working or factory drying plants will be necessary. The various existing methods have been reviewed in a Swedish paper (Ref. 16). It appears that the tray dryer at present leaves much to be desired both in uniformity of the product and in economy of working and that the conveyor dryer is a more satisfactory alternative. Rapid drying can be carried out in rotary kilns or by using pneumatic conveyors. Both methods use high temperatures and are efficient in operation, but their high initial cost would prevent their being used on the average farm. Accounts of the working of two rotary dryers have been published. In the Danish machine described by Hammer (Ref. 17) the material to be dried is forced between two metal cylinders by the rotation of the outer one. The hot air is fed to the inner cylinder whence it passes through perforations into the drying material. Apparently only moderate temperatures are used and the machine does not differ in principle from the ordinary flat conveyor type. The dryer described by Clyde (Ref. 18) on the other hand uses a temperature of upwards of 1,000°F. and both the crop and the products of the furnace combustion are sucked through annular drying chambers by a fan. 182 tons of various crops were dried during a season's experiment and a drying efficiency of about 56 per cent. was reached. Short grasses in the sense of the preceding paragraphs were not used, most of the materials being ordinary forage crops previously passed through a silage cutter. It is pointed out that the working of the machine was much improved if some natural drying of the crop took place beforehand.

Artificial drying whether of long or of short grass should eventually be of particular interest to the farmers in our Northern districts, who, so far, have been unable to take full advantage of mechanized methods of haymaking. One of their difficulties is the need in most seasons for putting the hay into pikes or cocks during making. Sweeps can be used for gathering hay into rough cocks which are afterwards shaped by hand, and they can also be used to transfer the cocks to a rick, but the need for intermediate hand work reduces their efficiency. In these districts the Tripod system (Ref. 19) may be of advantage. Semi-permanent cocks are built around metal tripods which include a device for leaving air vents at the bottom. Cocks so built are almost rainproof and their construction enables them to take the fullest advantage of every bit of drying weather. The method has also been used successfully in harvesting cereals as an alternative to stooking. According to the account given the method does not save labour but, with a very small expenditure on equipment, reduces weather risks to a minimum.

IV.—Tractors.

In several of the papers referred to earlier in this article, mention is made of farms on which the tractor has completely replaced the horse. These may not be typical examples of British practice, yet it is clear that the sphere of usefulness of the tractor is growing wider every year, and the machine which not long ago was used for little beyond ploughing and cultivating is now expected to take part in every kind of farming operation. Thus the prospective tractor user must base his choice of a machine on ever wider considerations and the points about which he will require information extend far beyond the scope of ordinary formal testing.

One of these points, the design of tractor wheels, is engaging the attention of many research stations, and during the year under review several papers on the subject have been published. In the first of these, Collins (Ref. 20) describes some efficiency tests of tractor wheels and tracks carried out during the last two years at the Iowa State College. A wheeled tractor and a tracklayer were each provided with a dynamometer so arranged that the torque applied to the back axle by the engine could be measured during ordinary working of the tractor. An exact comparison could thus be made between the power supplied to the drive wheels or tracks and the useful power developed at the drawbar. Furthermore, the difference between the two could be roughly divided into power lost by slippage and power consumed by the adhesion devices in compressing and penetrating the ground. As might be expected the tracks proved to be more efficient than the wheels in both directions. There was less slippage, particularly on cultivated land, and less power was consumed in maintaining a grip. Both on undisturbed and on cultivated land the tracklaying tractor attained an overall efficiency of nearly 80 per cent. at full load. The efficiency of the wheeled tractor on the other hand varied considerably with the ground conditions, and with the load. The maximum efficiency on undisturbed ground was nearly as high as with the tracks, but on cultivated ground it fell to round about 40 per cent. The difference in practice between the two types of machine will probably not be as great as the latter figure would indicate, since the operations which have to be carried out on cultivated land do not, in general, require the full drawbar pull of the tractor. In all-round working there will perhaps be an advantage in favour of the tracklayer of about 20 per cent., and a difference of about this order is, in fact, indicated by a comparison between the fuel consumptions recorded in the published results of tractor tests.

In the tests of the wheeled tractor, four different types of wheel were used, namely, two different sizes of conventional spade lug wheels and two sizes of a proprietary pattern of rimless wheel. The most interesting conclusion to be drawn from this part of the paper is that there was comparatively little difference between the different types, particularly in regard to the power absorbed by the adhesion devices in penetrating the ground. The practical significance of the results obtained is not very fully explained in the paper and the matter may be made clearer by a reference to some unpublished English work on the same subject. Tests, on lines very similar to those already described, have been carried out on three different types of steel wheels. A standard model tractor was fitted with each kind of wheel in turn and measurements were made of the power transmitted to the back axle when the tractor was running without load, under conditions such that wheel slippage was unappreciable. The results were much the same for each kind of wheel and showed that the power required amounted to over two horsepower for every mile per hour of speed. This means that when this tractor was running without load at about three miles per hour, nearly seven horsepower was being used mainly in pressing the wheel lugs into the ground. The power consumed increases with the rear wheel weight of the tractor, and measurements on a large machine have disclosed an even greater rolling resistance.

The next papers to be discussed deal with what is, perhaps, the most important development of recent years: the pneumatic tyred tractor wheel. Shields (Ref. 21) and Brunner (Ref. 22) describe the introduction of these wheels in America and give particulars of the sizes and types now adopted as standards for tractor use. The tyres are of lighter and more flexible construction than motor tyres and are inflated to a pressure of only from 10 to 12 pounds per square inch. The main advantage claimed for them is a much lower rolling resistance and a corresponding saving of fuel. In order, however, to obtain good adhesion it is necessary to provide additional weight at the rear of the tractor and in some cases as much as 500 lb. per wheel has been added. Some comparative tests of these wheels are described by McCuen (Ref. 23). Tests were made of a tractor fitted in turn with standard steel wheels and with the pneumatic tyres. On account of the decreased rolling resistance it was possible to work at a higher speed with the pneumatics and savings of from 9 to 25 per cent. in fuel were recorded. In ploughing with a two-furrow plough 27 per cent. more ground was ploughed in a given time and the fuel used per acre was reduced by nearly one quarter. That the tests were hardly a fair comparison between the two types of wheel is pointed out in a note by the present writer (Ref. 4d). In particular, rather low loads were used and the relative advantage of the pneumatic tyres in being able to work at a high speed with less loss of power was thus exaggerated. If, for example, in the ploughing tests the steel wheels had been used at low speed with a four-furrow plough, their performance compared with that of the pneumatics would no doubt have been much improved. From the point of view of British farmers, however, the advantages of pneumatic tyred wheels in other directions are so great that they are certain to be widely used provided only that they can maintain sufficient adhesion to play their part in the heavier work of the farm. Their greatest advantage is of course that they allow the tractor to be used on the road without change of wheels, and in dung carting or the carrying of hay and corn it will if necessary be possible to dispense with horses altogether. They will possess another advantage in such work as drilling and harrowing. Many farmers who are unable to afford the capital outlay involved by a track-laying tractor are doubtful about using an ordinary wheeled tractor on their seed beds. With pneumatic tyres, although the pressure on the ground will probably be as great as with steel wheels, much less damage will be done, since no part of them will penetrate the ground. No formal test of the capabilities of pneumatics in the heavier work has yet been made in this country. Such work as has been done, however, indicates that when used under dry conditions on tractors of the 10 to 15 drawbar horsepower class, they will equal the performance of steel wheels when the ground is firm and will do more than steel wheels when the ground is loose. Their efficiency is, however, reduced by the presence of moisture, and even the juice pressed out when a clover crop is being traversed has been found to lower appreciably the pull they will transmit. On very wet ground, particularly when it is firmer underneath, they are liable to fail altogether, but at least one firm supplies easily attached strakes for use in these circumstances.

The main items of expenditure which make up the total costs of tractor work have been discussed by the present writer (Ref. 24). Since the cost of fuel is a relatively small proportion of the total expenditure, it appears that there is less difference than might be expected between the working costs of the different types. The use of crude oil instead of paraffin will only effect an economy of about nine per cent., while the fuel savings of tracklaying machines will not, in general, be sufficient to balance their higher first cost. In the latter case, however, an ability to work on a greater number of days in the year gives an additional advantage the monetary worth of which cannot easily be estimated.

The factors which must be considered if the greatest reduction of production costs is to be effected by the use of tractors are discussed in a further paper (Ref. 4a). The need for fully loading the power unit is emphasized, but it is argued that the working speed should be kept as low as possible. It remains to be seen how far some of the arguments of this paper will be modified by the introduction of pneumatic tyred tractors.

V.—Root Crop Machinery.

It has been pointed out earlier in this article that one of the obstacles in the way of an extension of mechanized methods to mixed farming is the difficulty of dealing with the root break. The difficulty arises not because tractors cannot replace horses in cultivating root crops, but because in any case there remains a large amount of costly hand work to be done in singling and in lifting and topping. While little has yet been done to lower the cost of these operations, steady progress is being made in the application of the tractor to the other needs of the crop. At the Norfolk Agricultural Station at Sprowston (Ref. 25) experiments on the mechanical cultivation of sugar beet and mangolds have been carried out during the last two years. Drilling was done without difficulty using a tracklaying tractor and a steerage drill. Mangolds were drilled with a six-row drill leaving a headland only six yards wide, and much of the subsequent hoeing was done with a six-row multiple hoe fixed to the front of the tractor. A certain amount of damage was done to the plant, but in this connexion it should be noted that the hoe attachment did not arrive until the mangolds were well up and that the operator was quite without previous experience of such implements. The final crop was not far short of the usual standard for the district and no difficulty is anticipated in the present season. A hoe attachment similar to the above is now used on another farm for all the inter-row cultivation of 1,000 acres of sugar beet (Ref. 1). On the Sprowston farm, hoeing is normally done by a small motor cultivator except where some other implement is specially used for experimental purposes. The cultivator has worked exceedingly well on beet, mangolds and swedes, hoeing four rows at a time, while on peas six rows can be worked at once if desired. The machine is not expensive and enables one man to keep a considerable acreage thoroughly clean. One reason why more general use of similar tools is not made on other farms is probably because, particularly on heavier land, some experience is necessary on the part of the operator before good work can be done. Not many farmers are prepared to let the first acre be ruined and so a trial is rarely continued long enough to give the machine a fair chance.

As an attempt to lower the cost of a part of the thinning operations a study is also being made of "Cross-blocking," or the mechanical bunching of the plants before singling. In some of the Norfolk experiments a comparison was made between plots bunched by hand in the ordinary way and two other series of plots bunched by cross-blocking with a motor hoe and a horse hoe respectively. In each case a final plant of 35,000 plants per acre was aimed at, but even the hand bunched plots did not actually reach this population. The plant on the plots bunched by the motor hoe was considerably better than that on the horse hoed plots, due presumably to the plants knocked out by the horses' feet. The hand bunched plots were, however, superior to either of the cross-blocked areas, particularly in respect of the final yield. It is suggested that one reason for this was that a considerable number of single plants was left untouched by the hand workers and since these were not checked they made more vigorous growth. It was concluded that if cross-blocking is to be successful it must be done as early as possible and that a very good initial plant must be provided.

In a paper dealing with the development of sugar beet machinery in America, Mervine (Ref. 26) deals with cross-blocking in an original manner. He observes that in setting a machine for this work there are two factors to be adjusted: the width of the bunches that are to be left and the distance between them. Taking these factors into account together with the original plant population, he uses the theory of probability to develop a formula to give the correct setting of the hoes for any desired final plant population. Two correction factors are introduced to allow for the nature of seed and the errors of the singlers respectively. No experimental evidence is given, but it is stated that "the results obtained this year in cross-blocking work have been gratifying. From the engineer's point of view it has been interesting to be able to make a mechanical set-up based on mathematical calculations, that would give desired results." The same writer points out the need for not pulling the soil away from the plants in bunching and singling and suggests, too, that the bunches should be left untouched for some days after cross-blocking in order to give the "cock beet" a chance to assert itself.

An alternative way to reduce singling costs is to use a spacing drill. So far, however, this method has not been very successful as the final plant populations have generally been unsatisfactory. On at least two farms in this country, however, spacing drills are used for large acreages to the satisfaction of the growers, and further experimental work now in progress may bring about improvements.

The transplanting machine to which some reference was made last year is also capable of extension to such crops as sugar beet. In a note on a recent trial of the machine (Ref. 27), which describes work with cabbages, reference is made to the planting of a few sugar beet plants for seed. The machine has been used elsewhere during the season to plant a whole field of ordinary sugar beet and although no particulars are yet available, it is understood that the crop is making satisfactory progress.

Beet harvesting machinery has made little progress in this country. Some mechanical lifters have worked sufficiently well in the hands of experimenters to be worth following up, but generally no funds have been available for their further development.

The American paper referred to above describes a one-man self-propelled beet "combine", which lifts, elevates, tops, screens and loads the beets. The roots are pulled out by the tops and are gripped in the same way during topping. It is claimed that the machine can be set to do topping more accurately than by hand with either a straight or a tapered cut as desired.

Two of the writers previously referred to (Ref. 6) mentioned the possibility of developing a machine for harvesting kale. In this connexion a recently designed Russian cabbage harvester (Ref. 28) may be of interest. In this machine chains working over fixed rollers pull out the cabbages by gripping the stalks and a serrated knife fixed underneath severs the heads. The latter pass on to an elevator and are conveyed into one compartment of a cart hauled alongside, while the stalks and roots are similarly deposited in another compartment.

On many farms in the U.S.A. the potato crop is worked throughout by row crop tractors. According to a recent bulletin (Ref. 29) over 30 per cent. of the total man-hours of labour which such a crop requires is expended in hand picking behind the digger. This is in fact the only operation for which a satisfactory machine is lacking. A description is given of an experimental harvester designed to meet this need. The first year's working revealed a number of defects which are to be corrected but, since it saved about half the labour previously required, the machine was thought to be promising.

VI.—Soil Heating.

One of the consequences of the gradual replacement of the horse by mechanical transport is that market gardeners find it increasingly difficult to obtain adequate supplies of organic manure. As a result more and more attention is given each year to the subject of artificial soil heating, whether by steam, by hot water or by electricity. In this country this work is almost entirely confined to the heating of hot houses and frames, but on the continent and to a lesser extent in America the heating of plots of open ground has been studied. In the latter application of soil heating the object is not to find an alternative to organic manure but to develop a method of growing earlier crops. The same consideration applies to some of the newer aspects of glass house heating.

Three non-electrical methods of applying heat are described by Johansson in the Journal of the Ministry of Agriculture (Ref. 30). In the first of these—the Sigma system—steam is passed into pipes made of drain tiles or similar material laid in the soil. Since it mixes with a large volume of air the steam does not immediately condense, but passes through the tile junctions into the soil. In the Beck-Friis system, on the other hand, hot water is pumped through thin copper tubing which is laid in the soil in much the same way as electric heating cables and returns eventually to the reservoir. In the third method iron pipe of about one inch diameter is laid inside drain tiles and hot water is circulated without pumping. The first of these systems is well adapted for open soil heating while the last of them is more often used for frames, but all three methods have been used for both purposes. In experiments designed to test the three systems against organic manure for frame heating melons were grown, and, although all the frames were successful, those in which manure provided the necessary heat gave the best results. In similar experiments carried out with tomatoes in the open ground the manured plot again gave the greatest weight of crop. The heated plots, however, had the advantage that a much greater proportion of the total crop was ripened early and so was available when the demand was greatest. Open ground heating is also being tried in this country, using circulating hot water, and a recent reference to the subject (Ref. 31) indicates that it has been successful with a number of different crops. The cost of installation is high, but is much less than the cost of a similar area of glass houses. The soil temperature is maintained at about 80°F. and very rapid growth results. It is stated that lettuce planted early in April on the heated beds reached an average weight of 7½ oz. in seven weeks, while those on adjoining unheated ground weighed only 1¼ oz. after the same period.

It was suggested that the greater growth observed on the manured plots in Johansson's experiments might have been due to a greater liberation of carbon dioxide where manure was used, and further experiments were designed to test this. The paper describing these includes an English summary (Ref. 32). Measurements showed that a greater proportion of carbon dioxide was present in the air in the manured frames. Laying straw between the pipes and the soil in the artificially heated frames raised the CO_2 content and improved the crop, but this method was not convenient in practice, particularly as the beds required more frequent remaking. Where the soil originally contained a high proportion of organic matter the addition of straw had little or no effect. Various artificial manures were applied to the heated frames, but in no case was the yield so good as in the frames in which organic manures were used. In electrically heated frames a layer of charcoal has been sometimes used with the same object in view and the CO_2 content has been increased thereby, but Kable (Ref. 33) remarks that in American comparative tests of manure and electric hotbeds, more vigorous growth in the electric beds has always been reported regardless of the carbon dioxide present.

Generally speaking, it is now assumed that artificial heating when properly used is quite as effective as organic manure and, particularly in the case of electric heating, research is being directed at improving the methods of installation. Studies have been made in America (Ref. 34) of the relative merits of under-heat in which the cables are buried and over-heat in which they are suspended above the bed. Over-heat proved to be much less economical in current, but dried the soil less and also gave better protection from frost. Each system had, in fact, its own advantages and an attempt was made to strike a happy medium by laying the cables on the surface of the soil. An immediate advantage was a reduction of the labour required in laying out the bed and since the method was considered to be promising in other directions a further trial is to be made.

A paper by Brown (Ref. 4e) deals with two applications of frame heating by electricity: salad beds and nursery hotbeds. The former of these has received much attention on the continent and it is mentioned that as early as 1926 some 50,000 heads of lettuce were grown on electrically heated beds in Sweden. In this country, however, the practice of growing salad crops in hotbeds is not common and the application of the method to the raising of nursery stocks from seeds and cuttings is likely to be of greater importance. The experiments described in the paper deal mainly with the economic aspect of the problem, that is, assuming that for either of the above purposes it is necessary to maintain a frame at a certain temperature, what will be the most efficient and economical layout and method of control? This question has been studied both by small scale experiments and by observation of the working of a number of frames in commercial practice. Heat insulation was found to be of primary importance and savings of up to 25 per cent. of the total current could be effected by attention to this point without much increase in the cost of equipment. Of the various methods of control thermostats possessed obvious advantages and their higher first cost should in practice be repaid in better performance if not in actual cash return. The cost of electrical equipment for a four-light frame should not exceed 30*s*. per light, while under spring conditions a consumption of 15 kw.h. per light per week should be adequate. In one specific case a three-light frame was maintained for a year at a temperature of from 60° to 65°F. for a total consumption of 1,832 kw.h. Loadings of 5 watts and 7·5 watts per square foot are regarded as being suitable for salad beds and nursery hotbeds respectively, and it is suggested that where electricity is available at not more than one penny per unit both types of bed can be run economically.

In addition to the experimental results just summarized, the paper gives an interesting account of the experiences of various growers with nursery hotbeds, together with much valuable information about equipment and tariffs. Finally, for those who require still more information, a full list of references to work done in other countries is included.

One other aspect of electrical heating may be mentioned: the sterilization for nursery purposes of small quantities of soil. This may be done by means of a box heated by suitably disposed elements, as described by Carney (Ref. 35) or by means of resistance heating which makes use of the electrical resistance of the soil itself. The latter method is described by Krewatch and Kable (Ref. 36), who consider it to be essentially sound in spite of a number of difficulties which have been encountered.

VII.—SPRAYING.

Two quite distinct aspects of spraying are at present engaging a good deal of attention: the spraying of orchards and fruit plantations for pest control, and the spraying of cereal crops for the control of annual weeds. No papers dealing with the engineering side of the former problem have been published in this country, but in one of the papers previously cited (Ref. 4a) mention is made of a converted motor car equipped for powdering raspberry rows. The design of this particular device had a rather amusing origin. The powdering must be done at night and if a horse-drawn unit is to be used the horse must be rested during the previous day. Further, the particular night chosen must be fine and still, and it is not easy to judge beforehand whether the conditions will be suitable. Consequently in our uncertain climate the result is often a too well rested horse whose owner feels he is not getting his money's worth!

Orchard spraying in this country is generally done by portable plants, but in the U.S.A., where the orchards are generally larger, permanent stationary systems are becoming increasingly common. Two papers dealing with this development have been published recently. In the first, Cornell (Ref. 37) compares a survey carried out in 1932 of a number of orchards in West Virginia using stationary plants with a similar survey carried out four years earlier. A number of marked changes had taken place in the meantime. Working pressures had increased from about 400 lb. per sq. in. to 600 and in one case 700 lb. per sq. in., while spray guns had been almost completely replaced by multiple-nozzle rods. Another change was a general increase in the size of the spray hose, and a decrease in its length by the installation of additional lateral mains. In this State all pipe lines are laid on the surface except where roads are crossed, and very little of it is taken up in winter. All the users except one considered that the stationary system was the better one, since it was more flexible. By this they meant that a large portable plant cannot spray small trees without waste either of power or of spraying material, whereas a stationary plant can always be worked at full output by varying the number of spray crews according to the size of the trees.

A comparison both of cost of spraying and of output per man hour was made between portable and stationary systems, without any very definite result. It was concluded that neither system had any marked superiority over the other and such advantage as had been disclosed in favour of the stationary system was not great enough to be significant. A paper by Lacy (Ref. 38) on the other hand dealing with spray plants in Georgia is very definitely in favour of stationary plants. Originally introduced where the orchards were too steep for mobile units, they are gradually spreading on to the level lands. In this State practically all pipes are laid underground. In some cases they have been drawn in successfully by a tractor and subsoil plough. The average first cost of the complete system was about 31 dollars per acre and it is stated that at this price stationary plants can be used economically even on peach orchards which have a relatively short life. The stationary system is said to save from 40 to 50 per cent. of the labour involved by portable units, and in addition generally costs considerably less in repairs.

The most interesting development in spraying for the control of annual weeds has been the use of sulphuric acid, particularly for charlock in cereals. Several papers dealing with the purely agricultural aspect of the process have been published, while one account by MacDowall (Ref. 4f) includes some reference to the engineering problems involved. The chief difficulty is the very corrosive nature of the solution, and in Great Britain, where the process is not yet common, very few machines capable of resisting the acid attack are available. One of the machines described was specially interesting in that it employed a rotating disc instead of nozzles to produce the necessary fine spray, and the simplicity of this device would appear to make it particularly suitable for the present purpose. The particular model used, however, had several vulnerable parts and these are to be reconstructed, using acid-resisting materials.

The extermination of perennial weeds by a machine which injects carbon bisulphide below the surface of the soil is described by Frost (Ref. 39). An application of 1½ oz. of fluid per foot of travel was made at from 8 to 12 inches depth by a specially designed subsoiler working in rows spaced 20 inches apart. In plots densely covered with bindweed an average of about 80 per cent. of the weeds were killed.

VIII.—MISCELLANEOUS NOTES.

Beyond the studies of Soil Heating already described, there has been little development in the application of Electricity to Agriculture. Some of the difficulties in the way of a general advance in this field are described by Denham (Ref. 40).

It is pointed out that farmers will not, in general, be attracted by such conveniences as push-button control, but will need to be convinced that a conversion to electric power will appreciably reduce their running costs. In field work, even if costs can be reduced, lack of flexibility is likely to rule out electric appliances on most farms. The most promising fields for supply engineers to explore appear to be the various forms of intensive farming and such semi-domestic applications as electric pumping plants.

Since the appearance, some years ago, of a bulletin on the subject of windmills for the generation of electricity, a steady interest has been taken by landowners and farmers in the subject and a new edition has recently been issued (Ref. 4g). No doubt interest is attracted to wind power by a feeling that something may be got for nothing. This feeling is evidently mistaken, since the estimates given indicate that when the initial expenditure on the plant is properly taken into consideration the cost of electricity generated in this way ranges from 4*d.* to 1*s.* per kw.h.

Reference was made in the last number of the *Farmer's Guide* to some experiments in progress at Wye designed to test an impression that consolidation by tractor wheels was conducive to higher yields of barley. Two fields were included in these trials, but according to the report of the results (Ref. 41) there were no significant differences between yields following the four types of treatment adopted.

At the same centre further experiments have been carried out by Davies (Ref. 42) with the instrument known as the soil compactometer. The results show that the resistance of soil to penetration by different probes varies considerably with the shape of the probe. For some reason as yet unknown a blunt ended probe requires less force to insert it than a sharp one and further experiments are being projected to explore the variations encountered.

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PESTS AND PARASITES.

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IN this chapter in the *Farmer's Guide* for 1931 it was pointed out that the economic situation, and notably the agricultural depression, was having a marked effect upon the research work upon pests and parasites that was in progress throughout the world. This was equally notable in the year 1932. Farmers were unwilling, and indeed often unable, to consider any expenditure upon pest control with crops that were unremunerative, while Research Stations have had to carry on with restricted incomes and curtail their programmes of work to those lines that seemed most profitable from the practical standpoint. Again therefore the result has been to concentrate the attention of research workers upon problems arising in the production of fruit, vegetables, and in other forms of intensive cultivation, while there has been a relative neglect of those that concern cereals, forage, and other crops of the ordinary arable farm. Whether the wheat quota scheme will lead to an increased demand for the investigation of wheat pests it is still too early to say, but if this should prove to be the case it will automatically involve more attention to the pests of other arable crops since wheat cannot be considered as an isolated unit separate altogether as regards pests from the other crops in the rotation in which it is grown.

Apart from the tendency to concentrate upon the troubles of crops grown under intensive cultivation, the most noticeable feature in present-day entomological work is an increasing devotion to problems related directly or indirectly to insect physiology, such as the effects of climate upon insects, their responses to light, changes in temperature, rainfall, insect migration, and so forth. The investigations required to provide information on subjects of this sort must often seem to the practical man academic and remote from the problems by which he is troubled, but actually they form the only sound foundation upon which to develop better methods of controlling insects in the future. At present, for instance, practically nothing is known as to why a certain pest is very destructive in one year and almost absent in another, as is so frequently the case with agricultural pests. If the reasons for the rapid rise or decline in the numbers of any injurious pest can be discovered, not only will it be possible to confine the use of preventive measures to those seasons when an abundance is probable, but also methods may be found of varying the conditions so as to prevent any undue rise in numbers. Work along such lines must of course be slow in giving practical results, but it offers the best prospect of reaching an altogether higher standard in the control of insect pests, and therefore it is clear that a proportion of the world's entomological effort should be devoted to purely scientific studies rather than to the application to practical ends of principles already well known.

Finally, reference may be made to one other line of work, of a rather specialized character, that is attracting the attention of workers in many parts of the world, *viz.* the transmission of virus diseases by insects. While in certain cases such diseases are transmitted from plant to plant by direct contact or by the seed, in the great majority of cases the infection of healthy plants is brought about by insects. The attention of the agricultural entomologist has now, therefore, to be directed to research upon a number of insects that may not directly be of much importance as pests, but that, indirectly as transmitters of virus diseases, may have the same importance that the mosquito has in spreading malaria. The growing realization that insects in one way or another are our chief competitors for the dominion of the world has led to the publication of one or two books in which the subject is dealt with in a non-technical manner and which will not only give the reader a better idea of the entomological problems with which the world is faced, but will also show that entomology is a more "human" subject than perhaps he had previously supposed (Ref. 1).

I.—CEREAL CROPS.

There is very little to report for the year 1932 in respect of the pests of the cereal crops grown in temperate climates, which appear to have attracted less attention than usual from investigators in any part of the world. Reference may be made here, however, to the outstanding problem of the control of wireworms, which has recently been the subject of discussion on the American continent—without, it must be confessed, throwing much further light on the best methods to adopt. From a number of papers read before the American Society of Economic Entomologists, it seems that carbon bisulphide injected into the soil at the rate of 100 lb. to 5,000 square feet proved effective, but it is obviously a treatment of no use to the farmer, both as regards cost of material and labour of application. Of other dressings tried, sulphur, even at the rate of 1,000 lb. per acre, proved useless. Where it is necessary to clear a small area of land from wireworms, calcium cyanide combined with a cereal sown as a trap crop, seems to be as good as anything. Miles, describing its use under glass, drilled rows of wheat 3 feet apart and after the wheat had germinated and attracted the wireworms to the rows, calcium cyanide at the rate of 1½ lb. calcium cyanide to 150 feet of row was sowed into a furrow close to the wheat, which was turned in, so as to get the wheat and wireworms over the cyanide. Used in this manner, 120 lb. of calcium cyanide (cost approximately 1*s*. 2*d*. per lb.) are needed per acre, so that where it is vitally important to deal with wireworm-infested land, the treatment is not altogether out of the question. Since wireworms live for some five years and are most destructive during three of these years, the cost of freeing land from the pest should be treated as a charge against the income for at least three years; a heavy first cost in some cases at all events is therefore justified (Ref. 2, 3, 4, 5).

Frit Fly.

The damage caused by Frit Fly still seems at a relatively low ebb, as compared with the pre-war and war periods, but it may be of interest to record that a mixture of oats and barley (4 to 1) when sown together is said to escape the fly (Ref. 6).

St. Mark's Flies.

The grubs of these flies are found at times in large numbers, more or less in colonies in the soil, and the question whether they are likely to cause serious damage to crops is sometimes asked. In Great Britain they often seem to occur in plenty without causing any apparent damage, but it appears that in Czecho-Slovakia they are regarded definitely as cereal pests. The treatment recommended is the application of top dressings of artificials, that found best being nitro-chalk, but whether the effect is merely in stimulating the growth of the crop or whether the substance has any insecticidal effect is not clear. The adult St. Mark's Fly is quite harmless, and is a large, rather sluggish black fly which readers may have noticed on fruit blossoms. (Incidentally, pheasants are very fond of the grubs, of which their crops are sometimes quite full.) (Ref. 7.)

Wheat Midges.

The minute orange or yellow maggots of the Wheat Midges are in some years very numerous in the ears of wheat and may cause an apparently good crop to give a very disappointing yield. The maggots when full grown leave the wheat ears and fall to the soil of the field, where they remain as larvae or pupae until the following summer ; midges then emerge and search for wheat crops on which to lay their eggs. The factors responsible for the variation in numbers of the pests from year to year are under investigation at Rothamsted. It may be of interest to record an observation in Germany that an application of kainit applied to a field after ploughing in the stubble destroyed 80 per cent. of the larvae in the soil, and that even when the manure was not applied until spring the number killed was nearly the same (Ref. 8).

II.—POTATOES.

*Colorado Beetle**.

The accounts of the spread of this pest in France in 1932 do not make cheerful reading. The insect now occupies the greater part of central France, and is within a few miles of the northern coast at St. Malo ; its arrival at the Channel Ports in the near future seems almost a certainty, and the risks of occasional beetles being carried—or even flying—across the Channel will then be considerable. If sufficient vigilance is exercised by potato growers there is no reason why Great Britain should be permanently colonized by the pest, although the occasional—and perhaps frequent—extermination of colonies that attempt to establish themselves will be necessary. The alternative to extermination is the regular spraying of all potatoes with an arsenical insecticide which prevents the beetle from doing any appreciable damage. Possibly three applications would be sufficient in Great Britain (five may be needed in North America) and so potato growers may calculate the

* Since this note was written a small outbreak at Tilbury has been reported.

cost of the establishment of the beetle as the expense of spraying their potatoes not less than three times (Ref. 9).

Potato Aphides and Virus Diseases.

That aphides, notably the Peach Aphis, are primarily responsible for the spread of Leaf Roll and certain other virus diseases in the potato is generally recognised, and it has therefore been assumed that in those districts capable of producing good quality seed potatoes, the aphides must either be absent or themselves be free from potato " virus ". More light is now being thrown on this subject by Maldwyn Davies at Bangor, North Wales, working in connexion with a scheme for growing seed potatoes in that area. A considerable number of centres both in North Wales and Anglesey, some at high elevations, some at low, some in exposed situations and others well sheltered, have been tested by Whitehead and Curry for their ability to produce high quality seed potatoes. Of these centres a certain number have proved failures, owing to the rapid spread of virus diseases in crops which, to start with, were very free from these troubles. Other centres, however, have been remarkably successful and have demonstrated that seed potatoes of high quality can be grown in North Wales. It might naturally have been expected that those at high elevations or exposed situations would have been most successful owing to their apparent unsuitability to aphides, but this has not proved to be the case. Aphides have been found at all centres, successful and unsuccessful, and the difference between them is suggested as possibly due to the date at which infestation takes place. The unsuccessful centres became infested early in the season, whereas infestation has been much later in those that are successful, thus allowing the aphides less time to distribute disease before the dying down of the foliage. In order that the diseases may be spread it is evident that, in the first place, there must be a stock of aphides available in early summer to infest the young potato foliage; next these aphides must feed first on virus affected plants and then move on to other and healthy potatoes. If a potato field, planted with seed containing little " virus ", is far from any source of aphides in early summer, or if it is out of the line of their early migrations, it will only become infested by aphides so late as to render any appreciable spread of virus diseases out of the question. From the practical standpoint the work is of great importance as it suggests that it may shortly be possible, by investigating the aphid population of potatoes at different times in the summer, to pick out those districts capable of growing good seed potatoes, and more is likely to be heard of this aspect of the matter. Finally, and rather as a matter of interest than as of immediate practical importance, it may be mentioned that Davies calculated that in a light aphis infestation, one indeed that would take some observation to detect, there are present in the potato field some 2,000,000 aphides per acre, whereas in a heavy infestation the number is 27,000,000 per acre or more. It may not unnaturally be suggested that the drain on the potato plants through the sucking of such enormous numbers of aphides would render the control of the pests worth while, quite apart from the virus disease questions, and this is an aspect that might be worth following up (Ref. 10, 11).

Potato Sickness.

The Imperial Bureau of Agricultural Parasitology has published a useful summary of our knowledge relating to the Potato Root Eelworm and Potato Sick soils. The destruction of the eelworm by means of chemicals applied to the soil is regarded as offering little prospect of success and attention is now being devoted to the effect of the excretions from the roots of different plants upon the hatching of the eelworm eggs. It will be recalled that these eggs, in the " cyst " formed by the skin of the parent eelworm, are able to lie dormant in the soil for long periods ; when potatoes are planted, however, the eggs are influenced in some way by the potato roots and hatch into young eelworms. As the Potato Root Eelworm appears to belong to a strain capable of living only upon the potato, it is clear that if the eggs can be stimulated to hatch in soil in which no potatoes are growing the young eelworms will starve to death. Mustard was found to be one of the plants which contained in its roots a substance capable of causing the eggs to hatch, but the influence of growing mustard was not found to give the results hoped for. Apparently a grass, of some kind not stated, is considered to offer distinctly better chances of success and further developments will be awaited with interest since the Potato Root Eelworm problem is of serious and increasing importance in several important potato-growing districts (Ref. 12).

III.—Roots and Farm Vegetables.

In case the reader may feel disposed to criticize the heading to this section—Roots and Farm Vegetables—it should perhaps be explained that it is very convenient from the pest standpoint : turnips, for instance, whether grown for feeding sheep or for marketing as " vegetables " are subject to the same pest attacks, and this applies to Horse Beans and Broad Beans, Sugar Beet and Beet for salad, and so on. Any subdivision in accordance with the purpose for which the crops are grown would therefore result in much duplication and seems undesirable.

Crane Flies (Leather Jackets).

The bran and Paris green bait continues to give good results. In the *Wye Journal* a case is recorded in which a field intended for mangolds was found to be swarming with the pests, and it was therefore treated with the bait, and a successful crop of mangolds subsequently obtained (Ref. 13).

Diamond-back Moth.

In the *Farmer's Guide for* 1931 reference was made to the success obtained in Australia by dusting with lead arsenate or nicotine dust crops of turnip, cabbage, etc., infested by the caterpillars of this pest. As the use of these remedies, especially the lead arsenate dust, is undesirable with cabbage, cauliflower, and such crops after they have started to turn in, it is worth recording that the Australians have got good results with Derris insecticides (which have obtained such importance in connexion with Raspberry Beetle—see pp. 186–188 (Ref. 14)).

Mangold Fly.

Fortunately this destructive pest of mangolds and sugar beet still seems at a fairly low ebb in Great Britain, but it may at any time increase again to serious proportions and it is therefore of interest that the poison bait treatment as developed by Belgian workers shows signs of being definitely successful. The bait consists of sodium fluoride 3–4 lb., sugar 20 lb., water 100 lb., which is sprayed on to the crop at the rate of only 6½ gallons per acre. The object is to poison the adult flies before any egs are laid as the solution is quite useless against the maggots mining in the leaves. For application a knapsack sprayer would be adequate, the object being not to coat the plants with the insecticide, but rather to get a fair distribution of coarse drops, so that the flies will easily be able to find the bait and feed upon it. As to timing the application, it would be preferable to get entomological advice, but failing this the bait might be distributed when the plants are just showing the first "rough" leaf. If rain falls directly after spraying, the treatment will of course have to be repeated. Usually the early attack of the fly is the more serious as the plants are then small, but in a bad year, when the pest is very numerous, several sprayings would be worth while, and in view of the very small quantity of bait needed, should not prove too costly.

As bearing on the prevalence of the fly, it is suggested by

Continental work that the parasites of the pest are able to keep it under control if the mean temperature in summer is 62°F. or over. Apparently then a serious attack is more likely during, or in the year after, cool summers than when the summers are hot. This sort of observation, if followed up, may lead to the possibility of stating precisely when the use of such treatments as the poison bait mentioned above would be worth while (Ref. 15, 16, 17).

Onion Fly.

It is noticed in Canada, as in England, that this insect is not a pest on all soils, and experimentally it was shown, by mixing clay and sand in different proportions, that most eggs were laid in soil half clay and half sand, which would presumably give a light loam—just the soil favoured by the fly in the open in Canada. In Great Britain also onions grown on light soils are the most affected (Ref. 18).

Pea Thrips

remains an unsolved problem in so far as the exercise of any adequate control is concerned. Swedish investigators who have tried spraying state that it is not worth while (Ref. 19).

Pebble Moth.

The caterpillars of this moth—which are far less conspicuous than those of the White Butterflies—may nevertheless be a source of considerable loss to market garden crops (cauliflowers, broccoli, etc.). The control of the first generation of caterpillars, which occurs in June, is important. Miles states that spraying with either nicotine and soap or a Derris mixture is effective, and that it is worth while to dip seedlings in one of these insecticides before planting out (Ref. 20).

Tingid Bugs.

Two species of these bugs, rather widely distributed in Great Britain, especially near the coast, feed upon plants allied to beet and on the Continent one of them has proved a serious pest to sugar beet. The transfer from wild plants to sugar beet in England is not improbable when the crop is grown on light soils, and it may therefore be worth recording that in north-east Saxony, the control adopted is to sow narrow strips of beet early in the season, which then become infested and after being dusted or sprayed with an insecticide are ploughed in. The field can then be sown with safety as the bugs in the immediate neighbourhood have been destroyed. This would appear to be a very troublesome method of dealing with the pest, but apparently where the latter are numerous it may be worth while (Ref. 21).

Tortoise Beetles.

A rather similar case is that of certain kinds of "Tortoise Beetles" which are very destructive to sugar beet in Europe, and which occur in Great Britain, again more especially near the coast, but have not yet been found upon the beet crop. As they may take to beet in England, it is useful to know that early spraying with lead arsenate, or later dusting with calcium arsenate, is found effective both in Italy and Spain. Tortoise Beetles are round or oblong, about ¼ inch in length, and shaped rather like a tortoise—even more, perhaps, like a large "scale" insect. In colour they are green or grey and green, sometimes with a brilliant metallic gold streak down each wing case. They should be looked for on the beet leaves, and any reports of their occurrence on beet in England would be of interest (Ref. 22, 23).

IV.—FRUIT.

In Great Britain more work has been devoted to the pests of fruit than to those of any other category of crops and the results obtained in 1932 have not in all cases been published at the time when this article was written. Before it is in print, further information may be available upon some of the subjects dealt with here, a point that the reader should bear in mind.

Apple Blossom Weevil.

This pest seems, during the past two or three years, to be definitely increasing in numbers and importance; its control is, indeed, regarded by some growers as the most serious problem to be solved after that of the Apple Sawfly has been dealt with. Little was published in 1932 that is of immediate assistance to the grower, but it may be of interest to note that on the continent of Europe a considerable discussion has been in progress as to whether the Apple Blossom Weevil is really harmful—one side advancing the argument sometimes heard in England that the assistance of the weevil in thinning out excess fruit compensates for the harm it also does. On the whole, the conclusion of Continental writers coincides with that of most English growers in regarding the weevil, anyhow when in considerable numbers, as very destructive. At the same time, there is no doubt that the damage is sometimes over-estimated. Often, for instance, it is noted that the only fruitlet of a truss to remain alive after blossoming is one attacked by the weevil and it is assumed that if not infested this particular fruitlet would have grown to maturity. This, however, is by no means necessarily the case, for the capped blossom, possibly because its inner parts are protected by the folded petals, seems immune from frost and other adverse weather conditions that affect open blossoms. Therefore, when only capped blossom is seen on a truss of which the other blossoms have failed to set, it is highly probable that the capped blossom would also have failed if left alone by the weevil. The pest may therefore appear to have caused great damage although it has only destroyed fruitlets that would never in any case have grown to maturity (Ref. 24).

Apple Sawfly.

In view of the increasing importance of this pest, it has become essential to look much more closely into its life history and habits and reference may be made to a paper on this subject by H. W. Miles of Manchester. Among the points brought out in this investigation is the fact that the fly is egg-laying over a fairly long period so that there is less difference in the infestation of early and late flowering varieties than might have been expected—Beauty of Bath, for instance, in full flower on May 12th being infested to the extent of 29 per cent. of the fruits, and Newton Wonder in flower on May 19th infested to the extent of 21 per cent. of the fruits. Difference in varietal susceptibility is also brought out, Worcester Pearmain, well-known as a variety very subject to the pest, being attacked to the extent of 44.6 per cent. under conditions in which Cox's only suffered to the extent of 7.7 per cent.

The same investigator also attempted to keep off the adult fly by dusting with naphthalene. Four applications were made—May 24th (when from 10–20 per cent. of the blossoms were open); May 28th; June 3rd; and June 6th (when only 10–20 per cent. of the flowers still retained their petals). The trees were "bushes" 8–9 feet high with branches extending about 6 feet. Each application required 3 lb. of the dust for 20 trees, and an attack of 25 per cent. on the check plots was reduced to 7 per cent. on those that were dusted. Although a light application of dust in this manner can be made very quickly, the fact that the dust does not kill the flies and the length of time during which it is necessary to protect the blossoms (and consequently the number of applications necessary) make it unlikely that the treatment will become popular, unless the difficulties experienced in using the previously discovered nicotine treatment prove too great. This latter treatment aims at killing the sawfly larvae as soon as they have hatched and before they have burrowed too deeply into the apple. As the period when the larvae are susceptible to spraying is short, accurate timing of the spray is essential, and may be exceedingly difficult in a plantation of mixed varieties flowering at different times. As showing what can be done, however, reference may be made to experiments by Kearns and Swarbrick, who, spraying at Long Ashton between the 3rd and 8th day after petal fall, reduced an infestation of 54.8 per cent. to one varying from 5.6 to 12.9 per cent. At the time of writing, the results of the 1933 experiments on the subject are not yet available in print, but so far as they have been disclosed they indicate that by accurate timing and efficient spraying sawfly attack can be reduced to very small proportions, and those interested should make a point of getting the latest information before next season (Ref. 25, 26, 27).

Bud Moth.

Rather less has been heard of this pest than was the case a few years ago, but it is nevertheless worth recording that a successful control has been obtained in New York by adding nicotine to the lime sulphur or mineral oil wash applied at the "green tip" stage (Ref. 28).

Capsid Bugs.

The Capsid problem, not many years ago the most serious problem with which apple growers were faced, seems to have lost some of its importance, whether judged by work published in 1932 or by the interest expressed in it by the industry. This certainly does not mean that the Capsids themselves have become less formidable or numerous, but rather that growers are finding that they can exercise an adequate control and in consequence are seeking the assistance of research workers rather on problems that are less nearly solved. This result may be attributed in part to the use of mineral oil winter washes (either alone or in combination with a tar distillate), but also to the improvement in the actual spraying which is being brought about, thanks to the insistence on the importance of spraying technique by all concerned in dealing with diseases and pests. Two papers published during the year may be noticed. One by Walton and Staniland appears in the Long Ashton Report for 1931 and gives the results of the concluding year's experiments with the special tar distillate washes that originated at Long Ashton. Reference should be made to the paper itself for details, but broadly speaking the results were somewhat uneven, occasional failures being reported among the successes. The most effective spray was apparently a mixture of tar distillate and mineral oil, the latter being either "white oil" or "half-white oil." Edwardes, experimenting with winter washes in the north-west Midlands, reached a rather similar conclusion in respect of Capsid control —his best results being obtained with a mixture of mineral oil and " modified " Long Ashton tar-distillate diluted to 12 per cent., no damage to the trees being caused. Tar distillates of the " Long Ashton " type alone were liable to injure buds, and mineral oils although effective against Capsids were inadequate against other pests, but the virtues of each were obtained by the combination. Opinions in the industry, however, still differ as to whether it is best to use the tar distillate and mineral oil as separate applications or in a mixture—some at all events favour the former since the mineral oil wash can then be applied later when it is more effective against Capsid (and apparently less likely to cause injury). Finally it may be worth noting that a Capsid, known in America as the Tarnished Plant Bug, which is also abundant in Britain, is proving a serious pest to fruit in America although it does not yet seem to have attacked fruit in England. Here it is very destructive to chrysanthemums, and is sometimes known to growers as the " Bishop." This Capsid differs from the Apple Capsid and the Common Green Capsid in spending the winter as an adult bug hidden in hedge bottoms, dead leaves, etc. If it ever transfers its attentions to fruit, therefore, winter spraying will be useless, and the problem of controlling it will be serious (Ref. 29, 30, 31).

Cherry Fruit Moth.

The caterpillars of this small moth bore into the young cherries and may cause serious harm. It is therefore worth recording that in Germany some success in controlling the pest has been obtained by the use of a bait spray containing 0.2 per cent. of a proprietary Derris insecticide and 4 per cent. molasses. The bait is applied to kill the moth, which emerges in late June and July, and a very light dressing, making no attempt to spray the trees thoroughly, should be sufficient. The number of applications would depend on the weather, but one during the last week in June and a second at the end of the first week in July would be worth a trial where the pest is of serious importance (Ref. 32).

Raspberry Beetle.

The work on this pest during 1932 was carried out on a large scale and in order to make the story reasonably complete it is necessary to refer to various publications that did not appear until 1933. Experiments by Steer at East Malling proved entirely successful and showed that on a commercial scale the pest can be satisfactorily controlled by spraying twice with a Derris insecticide. The times of application in the case of loganberries are 10–15 days after flowering begins, and again 10–15 days later; for raspberries the first application should be 10 days after flowering begins and the second as in the case of loganberries. It is also shown that a good commercial control can be obtained even by only one spraying, given at the time of the second application just mentioned, which in an average season is about the last week in June. As the cost of one spraying is stated to vary from £1–£2 per acre in all, it is doubtful whether the omission of the first application would be wise unless the price of the fruit drops very considerably.

The East Malling experiments also show that satisfactory commercial results can be obtained by means of Derris dusts and by spraying with nicotine and soap, but the control obtained by the former was not quite so good as with wet sprays and there is some risk of an unsightly deposit on the fruit, while the nicotine spraying was somewhat more expensive; the East Malling views appear therefore to favour spraying with Derris as the most satisfactory remedy. The Derris insecticide used consisted of Derris powder and soap, the washes being standardized to contain 0·005 per cent. rotenone, which proved adequate, although double this strength was also tried. Where a Derris of unknown strength is bought the rotenone content gives the best clue to the dilution desirable, but it may be mentioned that the proprietary Derris insecticides on the market appear to be satisfactory if diluted to the strength advised by their makers for caterpillars and biting insects. A further reference to Derris will be made in a later section.

The Raspberry Beetle was also the subject of attention at Long Ashton and Cambridge. At Long Ashton both Derris and Pyrethrum insecticides were used and while both were effective, the Derris owing to its less cost and the fact that it remains toxic for longer is definitely preferred. A further point brought out, however, is that it may, in certain seasons, at all events, be desirable to tackle the beetles as well as their larvae (the treatments so far referred to have all been directed against the larvae or maggots). In this case a Derris dust (rotenone content, 0·18 per cent.) is advised when the beetles are clustering in the flowers, followed by one Derris spraying against the larvae. The destruction of the beetle, instead of the larvae, has received further emphasis in experiments carried out by Petherbridge and Thomas at Cambridge, who showed that by two dustings with Derris powder (rotenone content 0·2 per cent.) a thoroughly satisfactory result was obtained. Two sprayings with nicotine sulphate and soap against the larvae also gave good results. Finally, it may be mentioned that the Long Ashton workers have also used an insecticide containing barium fluosilicate as its active agent with excellent preliminary results, but it is yet too early to judge whether this insecticide will prove in all respects satisfactory for the purpose.

It is clear then that the Raspberry Beetle, a few years ago regarded as an uncontrollable pest, has at last been conquered and it is now only necessary to decide the relative merits of the various methods and insecticides available (Ref. 33, 34, 35, 36, 37).

Red Spiders (and other mites).

Reference may be made to a useful account of the red spiders and other mites that attack top and soft fruits by A. M. Massee. The article, being in itself in the nature of a summary, cannot be adequately dealt with here, and it can only be stated that in addition to the less known mites, such important pests as the Gooseberry Red Spider, and Black Currant Mite, the Fruit Tree Red Spider, and the various mites that attack strawberries are described, together with the methods known for their control. It is perhaps worth noting that where lime sulphur is used to destroy red spiders or mites, as is often the case, the addition of gelatine (1 lb. per 100 gallons of wash) is usually advised. Thus, for the Strawberry *Tarsonemus*, it is advised that runners should be dipped between September and March in 3 per cent. lime sulphur with gelatine (1 lb. per 100 gallons) and that possibly spraying old beds in March may be of assistance against this pest (Ref. 38).

San José Scale.

This insect on its introduction into America proved extraordinarily destructive and it still remains a formidable pest in certain parts of that continent, although largely controlled by lime sulphur and oil washes applied during the "delayed dormant" period. It is therefore of interest to note that the insect is now reported from Austria and Hungary, where endeavours to eradicate it are in progress. Fortunately it seems to be an insect that thrives in climates with higher summer temperatures than commonly occur in Great Britain (which has indeed a climate that appears to be rather unfavourable to scale insects in general). Nevertheless, small round scale insects discovered on fruit trees should not be neglected: they will probably turn out to be the relatively harmless Oyster Shell Scale, but an expert opinion should be obtained to make sure (Ref. 39).

Strawberry Weevil.

Further notes on the life history and habits of this pest have been published by Jary, but there is little as yet to add in respect of control measures, although it is understood that the experiments with dust sprays containing arsenic in progress in Hampshire are fairly promising (Ref. 40).

Strawberry " Troubles ".

The recognition of " virus " diseases as among the troubles to which the strawberry is susceptible has taken more definite shape as a result of work at East Malling, but no additional enemies have been detected to add to the eelworms, aphides, red spiders or *Tarsonemus* mites that, together or separately, have been regarded as contributing to the difficulty in growing strawberries at the present time. The hot water treatment, however, which aims at the provision of young plants, practically free from eelworm, insect or mite enemies, has continued to give promising results ; the investigators experimenting with the treatment would perhaps have preferred to elaborate it still further before advising its use by growers, but as some of the latter are already taking it up, certain points emphasized by W. E. H. Hodson in a preliminary paper are worth recalling. The temperature of the bath must be kept accurately at 110°F., as even 112° or 114° for any appreciable length of time checks the plants. Thorough circulation of the water is thus essential to prevent the development of too high temperatures in " hot spots " in the bath. The length of the dipping should be 30 minutes when the plants are vigorous and planting conditions good, so that immediate growth may be expected ; otherwise a treatment of only 20 minutes is advised. The plants for dipping are best packed, loosely, in lots of 200–300 in sprout nets so as to ensure easy penetration by the hot water and immediately after the hot water bath the plants must be cooled off, either by dipping in cold water or by spraying with a hose. Planting should take place immediately, but in any case the plants must not remain heaped or in bulk, but should be spread out so as to drain. Where wet plants are stowed in bulk, heating takes place and the majority become useless. As to the period of the year, it is suggested that early autumn is best and that the winter season should be avoided, the object being to plant out when the strawberries may be expected to establish themselves as quickly as possible.

There is no doubt that strawberries treated in this way are freed from many pests and planted under satisfactory conditions exhibit a remarkable growth as compared with untreated plants. Carelessness, however, of any sort leads to disastrous results and the treatment must not be looked upon as fool-proof (Ref. 41).

Woolly Aphis.

Until recently the story of the Woolly Aphis (or American Blight) has seemed to be fairly straightforward—*viz.* that some of the aphides remain on the apple trees, above or below ground, all the year round, whereas others migrate to elm, where winter eggs are laid ; that these eggs give rise to aphides in spring which first cause the elm leaves to curl up and later produce winged aphides that fly back to the apple. This is the life history of the insect on the American continent. European investigators have now thrown doubt on the migration to elm, and it seems that in Europe the Woolly Aphides on elm may belong to other species or races not destructive to apple. Matters are thus again in confusion, and no reference would have been made here to what may seem to be " progress in the wrong direction " if it were not that some growers have felt that they should cut down elms in proximity to their orchards. It is, in fact, true that in more than one instance apples in proximity to elms have appeared to be exceptionally susceptible to Woolly Aphis, but nevertheless the case against the elm must be taken as " not proven " and cutting down the trees is not as yet justified (Ref. 42).

V.—Insect Pests of Animals.

Bot Flies.

MacDougall has published an interesting summary of our knowledge in regard to Horse Bot Flies. It is pointed out that the newly hatched larvae enter the animal through the mucous membrane of the tongue and mouth. The treatment consists of the administration of bisulphide of carbon, but as this is a dangerous chemical when used as a drug, it should only be given under the supervision of a qualified veterinary surgeon (Ref. 43).

Clegs.

There has been some discussion during the year as to whether these pests cause cattle to " gad," in the same manner as they do when pursued by Warble Flies. Further observations on the subject are being made in 1933, but the evidence so far is inconclusive as it is difficult when cattle are gadding to get sufficiently close to determine which flies are actually responsible for the trouble. Bullocks can sometimes be found at rest even when actually being bitten by the small grey " cleg " which is so troublesome in marshy and moorland pastures, but equally they are noted gadding when only flies of this kind can be found. It is, at all events, probable that the bigger "clegs"—sometimes known as "forest flies"—cause gadding in the latter half of the summer, especially when the cattle are being continually worried by flies and are in a nervous condition (possibly as a result of their experience of warble flies earlier in the season). If clegs are in fact responsible for gadding, the problem of preventing it would seem almost hopeless. The grubs of the clegs occur in damp places and are inaccessible to attack, while the treatment of cattle with fly deterrents is not ordinarily a practical proposition. MacDougall reports a statement that oil of white birch is a good deterrent against clegs, but it is not suggested that its use on cattle would be practicable (Ref. 44).

Fly Sprays.

A great deal of attention has been given in the U.S.A. to the production of a dressing that can be used on cattle to ward off flies, unfortunately without any conspicuous success. Most of these sprays are of an oily nature, and it has now been shown that such sprays when applied to cattle in hot weather cause a small but definite rise in the body temperature of the animals—a disadvantage in itself (Ref. 45).

Sheep Maggot Flies (Blow Flies).

A lengthy report on the work against these pests in Australia has come to hand too late to be dealt with here, but the reference is given (Ref. 46) as readers interested in this subject may like to make a note of it.

In a report of the Director of Veterinary Services in South Africa, it is stated that even where fly-blown carcases were buried to a depth of 6 feet, the flies were still able to penetrate through the soil to the surface and escape. For dressing living sheep the following mixture is recommended—cotton-seed oil 45 parts, petrol 40 parts, pine tar oil 10 parts, carbolic acid 5 parts (Ref. 47).

In connexion with the attempt being made in Australia to control Blow Flies by means of insect parasites, Salt gives reasons for regarding the method as unlikely to achieve success (Ref. 48).

Sheep Nasal Fly.

Bisset records cases that seem to suggest that the presence of the maggots of this pest are associated with pneumonia in sheep (Ref. 49).

Warble Flies.

It may now be taken as proved from the work in Worcestershire, North Wales, Scotland and elsewhere, that the Derris treatment is effective in freeing cattle from the pest and is practicable on a large scale. As the conviction that this treatment is worth while is still confined to a certain number of farmers, experiments by W. M. Davies and L. Jones in North Wales are of importance as showing that a great reduction in Warble infestation can be secured on small areas even when the surrounding farms are not dealt with. For instance, on the Lleyn peninsula in 1929, 91·9 per cent. of the cattle were infested, with an average of 14·2 warbles per beast. In 1930-31, after treatment, 50 per cent. of the cattle were warbled, with only 2·2 per beast (untreated cattle still containing an average of 16 warbles, and with 91 per cent. infested). In 1931-32 only 22 per cent. of the animals were infested, and the average numbers of warbles per beast was less than 1. Again, in one valley in North Wales in 1931 79 per cent. of the cattle were infested, with an average of 11·7 per animal, while in 1932 this figure had been reduced to 15 per cent. with less than 1 per beast on the average. It is evident therefore that the Warble Fly does not go very far from where it is bred and that even if any general campaign against warbles is impracticable, small groups of farmers or even a single farmer occupying a large and somewhat isolated farm could keep the warbles down to such numbers as would be negligible so far as their effect on the condition of the animals, their milk production or their hides was concerned (Ref. 50).

VI.—INSECTICIDES AND SPRAYING.

The use of insecticides in spraying, dusting, and in other manners has now reached such proportions as to justify a section specially devoted to it. There appear to be no statistics to show the actual consumption of insecticides in Great Britain, but it may be of interest to quote certain figures given by Roark for the consumption in the U.S.A., as that in the British Empire would certainly be comparable. Roark's figures for the consumption per annum include—

Lead arsenate	30,000,000 lb.
Calcium arsenate	30,000,000 lb.
Mineral oil	5,000,000 gallons.

The fact that such immense quantities are used in one country alone indicates the importance that the subject of insecticides has now assumed, both as regards user and manufacturer, so that research upon it has great significance (Ref. 51).

In regard to Great Britain, the chief research development during the year has perhaps been towards the combination of different insecticides or of insecticides and fungicides. Some combinations—*e.g.*, Bordeaux and lead arsenate—have been known and used for many years, but in general it has been considered bad practice to use a contact insecticide (such as nicotine) mixed with such a fungicide as lime sulphur owing to the desire to apply the insecticide in coarse drenching spray and the fungicide as a fine mist. The grower, however, is now faced with the need for so many different spray applications in the course of the year, that there is hardly time to get them all on at the dates best for the objects in view, while the financial outlay involved in so much spraying is a difficulty little less serious. If satisfactory mixtures containing both insecticides and fungicides can be evolved, the number of separate spray applications to be applied will be considerably reduced. Work on this subject is in progress at Long Ashton, Wye, and elsewhere, and as an instance of the sort of thing that is being attempted reference may be made to a paper by Austin, Jary, and Martin, where a number of possible combinations are discussed. In addition to this, the various types of work mentioned in last year's *Guide* has been continued both as regards the search for new insecticides and the standardization (or evaluation) of those already known (Ref. 52, 53, 54).

References to other points of interest to the grower are as follows :—

Anabasine.

Experiments with this chemical (obtained from a plant *Anabasis aphylla*) have been carried out in England, Canada, and elsewhere, and it is found that in its effects it is approximately equal to nicotine ; if the insecticide can be produced at a definitely lower price than the latter substance, it may prove a valuable competitor, and it therefore seems worthy of a preliminary mention (Ref. 55).

Barium fluosilicate.

This insecticide is a stomach poison which from the human standpoint is said to be less objectionable than lead arsenate or other arsenicals, and it is attracting increasing attention. It is also available in a proprietary form. In case any grower is inclined to make a test, it may be noted that workers in the U.S.A. have recorded damage to the sprayed crops where the substance is used in combination with nicotine sulphate, and also with waters containing sulphates as impurities, so that the nature of the water available for spraying should be taken into consideration (Ref. 56).

Derris.

The increasing popularity of Derris insecticides makes the problem of standardization one of great importance, and there is some misunderstanding as to the value of the rotenone content for this purpose. Rotenone, which is contained in Derris and certain other insecticidal plants, is a very potent insecticide and the purchaser may be satisfied that in buying a Derris with a high rotenone content he will get a satisfactory insecticide. Critics have, however, pointed out that some Derris samples with a low rotenone content according to analysis are nevertheless highly insecticidal, due possibly to their containing toxic substances other than rotenone. This appears to be true, but until methods of evaluating these other substances have been discovered, their existence for practical purposes can be ignored by the grower, who may either buy Derris on the rotenone content or on the reputation of firms offering the insecticide to him. Other points of interest in connexion with Derris are that a Derris soap wash should be freshly prepared and not allowed to stand before use, as rotenone is affected by soap; also that some results have been obtained against Cabbage Root Fly by watering the plants (as in the well-known corrosive sublimate method) with a mixture containing 1 part of rotenone to 2,500 parts of water, and finally that rotenone (extracted from Derris, etc.) was quoted in the U.S.A. in 1932 at $10 per lb.

To show how intensely toxic rotenone is to insects, it may be recalled that the Derris wash used against Raspberry Beetles at East Malling contained 0·005 per cent. rotenone. A similar wash (as regards rotenone) would thus be made by mixing 1 lb. of the substance with 2,000 gallons of water, whereas this quantity of water would require 10 lb. of nicotine (95–98 per cent.) to produce a toxic wash. These remarks must not be taken as advising growers at present to purchase rotenone in the pure condition, as our knowledge of its practical use is hardly adequate; American opinion, however, seems to be leading to some such conclusion (Ref. 57, 58).

Lead Arsenate.

The possible danger of poisoning chickens or game where lead arsenate is used as a spray is occasionally a subject of discussion, and readers may therefore be interested in a paper by Thomas and Shealy in which are described experiments to discover the susceptibility of chickens to lead arsenate. It was found that by feeding fairly large doses of lead arsenate to chickens it was possible, as might be expected, to cause their death; but it is remarkable to learn that chickens suffered no ill effect after feeding for 60 days on grain previously soaked in a lead arsenate mixture of about the usual strength and being allowed during this period to drink only this mixture in place of water. (As the fluid was given to the birds out of an inverted fountain the possible criticism that the birds could not take the arsenate owing to its sinking to the bottom is satisfactorily met.)

Readers who have any special interest in the matter should refer to the original publication for details, but it may certainly be deduced that chickens are very unlikely to be poisoned as a result of normal spraying practice (Ref. 59).

Pyrethrum.

While pyrethrum insecticides increase their popularity for garden purposes, their cost limits their application in commercial conditions. In Kenya, however, where pyrethrum is grown for use on the farm, pyrethrum insecticides are widely employed, the extract often being home-made. The method recommended by the Agricultural Department of Kenya is to have a series of drums, each with a hole bored in the bottom and so placed that one drum runs into the top of the next. A plug of cotton wool is placed in each hole to act as a filter. Pyrethrum powder is placed in the drums and kerosene at the rate of 1 gallon to each 1 lb. of powder is allowed to percolate through, extracting the pyrethrins in passing. This mixture in Kenya is atomized directly on to the coffee trees for the control of the Coffee Bug, but there seems no reason why it should not equally be used as an emulsion in water. Pyrethrum growing for home use is not likely to attract many in England where the facilities for buying reliable insecticides are so great, but some readers may perhaps be interested in what is done overseas (Ref. 60).

Soil Insecticides.

The pressing need for a satisfactory soil insecticide still remains to be met and is perhaps the most difficult problem confronting the insecticide worker at the present time. The incorporation of lead arsenate with the soil has proved effective against chafer grubs and such like in the U.S.A., but owing to the cost the treatment is not practicable except for small areas.

Sulphite Lye.

In the process of pulping wood for the manufacture of paper, there is available as a by-product a substance known as sulphite lye, which was formerly regarded as waste. It now appears that the lye is a reasonably good substitute for soap in spraying and has the advantage over soap that it may be mixed with nearly all sprays without causing harm. In a useful summary of the subject Martin states that ¾ gallon of concentrated lye (1·3 specific gravity) is sufficient for 100 gallons of wash, and that the price of the concentrate is about £7 per ton. It would seem that sulphite lye may have a future in connexion with the mixed sprays to which reference was made earlier (Ref. 61).

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ENGLISH AND SCIENTIFIC NAMES OF PESTS DEALT WITH IN THE ARTICLE.

Apple Blossom Weevil (*Anthonomus pomorum* Linn.).
Apple Sawfly (*Hoplocampa testudinea* Htg.).
Bot Flies (*Gastrophilus equi* Fab.).
Bud Moth (*Hedya ocellana* Fab.).
Capsid Bugs (*Plesiocoris rugicollis* Fall.).
Cherry Fruit Moth (*Argyresthia nitidella* Fab.).
Clegs (*Tabanidae*).
Colorado Beetle (*Leptinotarsa decemlineata* Say).
Common Green Capsid (*Lygus pabulinus* Linn.).
Crane Flies (Leather Jackets) (*Tipula* spp.).
Diamond-back Moth (*Plutella maculipennis* Curt.).
Frit Fly (*Oscinis frit* Linn.).
Mangold Fly (*Pegomyia var betae* Curt.).
Onion Fly (*Hylemyia antiqua* Meig.).
Pea Thrips (*Frankliniella robusta* Uzel.).
Pebble Moth (*Pionea forficalis* Linn.).
Potato Aphides (*Myzus persicae* Sulz, etc.).
Potato Sickness (*Heterodera schachtii* Schmidt).
Raspberry Beetle (*Byturus tomentosus* Fab.).
Red Spiders (and other mites) (*Oligonychus, Tetranychus*, etc.).
St. Mark's Flies (*Bibio marci* Linn.).
San José Scale (*Aspidiotus perniciosus* Comst.).
Sheep Maggot Flies (*Lucilia* sp.)
Sheep Nasal Fly (*Gastrophilus nasalis* Linn.).
Strawberry Weevil (*Anthonomus rubi* Herbst.).
Tarnished Plant Bug (*Lygus pratensis* Linn.).
Tingid Bugs (*Piesma quadrata* Fieb. and *P. maculata* Lep.).
Tortoise Beetles (*Cassida* spp.).
Warble Flies (*Hypoderma* spp.).
Wheat Midges (*Sitodiplosis mosellana* Géhin. and *Contarinia tritici* Kirby).
Wireworms (*Agriotes* sp.).
Woolly Aphis (*Eriosoma lanigerum* Hausm.).

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SOILS AND MANURES.

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THE NATION'S FOOD.

THE purpose of soil management and fertilizer treatment is to increase the yield of crops or to cheapen their production, but obviously the farmer or at least the farmer's adviser must have some idea of the probable demand for the produce or he would not know how far any results obtained by new experiments were likely to be of practical interest. I shall therefore begin this account of the 1932 investigations on soils and fertilizers with a brief summary of the source of supplies of our more important foods so as to give a proper perspective to the rest of the report. A fuller discussion is given in my recent book, *The Farm and the Nation* (Ref. 1), but here I shall confine my attention only to the more important points. The data are in all cases from the Trade and Navigation returns (Ref. 2).

Wheat. The recently established quota has given wheat a new importance in the farmers' eyes and has opened up the possibility of far greater home production than we have had for some years. The chief sources of overseas supply have been, in million cwt. :—

[1] CHIEF WHEAT IMPORTS INCLUDING WHEAT MEAL AND FLOUR.

	Million cwt.	
	1931.	1932.
[2] Canada . . .	35·0	52·4
Soviet Union . . .	28·9	3·3
Australia . . .	26·9	28·1
Argentina . . .	21·7	21·2
[2] United States. . .	11·8	5·3
British India . . .	0·5	0·0
Other supplies . .	9·5	7·2
Total Imports . .	134·3	117·5
[3] Home Production (Great Britain) 1931/2 . .		23·3

Two important points are brought out by these figures :—

(1) The enormous advances made by Canada and Australia : in 1907 only 15 million cwt. or 13 per cent. of the total imports were from Canada and 8.5 million cwt. were from Australia ; in 1932 the Canadian share was 45 per cent. and the Australian 26 per cent. of the total.

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[1] Imports of wheat meal and flour have been converted into wheat, assuming that 100 parts of wheat yield 70 of flour.

[2] The 1931 figures for Canada and the United States represent the origin of the wheat and not simply the port of shipment. The Trade and Navigation returns show 32·5 from Canada and 14·1 from the United States but of this 2·3 was Canadian shipped via the United States. The figures have therefore been corrected to 35·0 from Canada and 11·8 from the United States. No correction is available for the 1932 figures.

[3] The figures for home production in this section are provisional estimates.

(2) The marked falling off of supplies from Russia and the United States. The 1933 figures, so far as they are available, are also very low, and it appears that these two countries might disappear from our sources of supply without serious consequences.

The Argentine shipments remain at a very uniform level. There is every reason to believe that Canada, Australia and the Argentine will remain as our chief sources of supply.

Beef. The supplies of beef (including tinned meats) have been, in million cwt. :—

CHIEF BEEF IMPORTS.

	Million cwt.	
	1931.	1932.
Argentina	9·39	9·05
Australia	1·14	0·96
Uruguay	1·01	0·70
Brazil	0·60	0·50
New Zealand	0·38	0·60
Other supplies	0·54	0·41
Total Imports	13·06	12·22
Home Production (Great Britain) 1931/2		10·4[1]

Since pre-war days there has been a marked expansion in supplies from Argentina. The chief reason has been the great improvement in refrigeration and in transport. This region of South America is climatically remarkably well suited to the growth of fodder plants, grasses and especially lucerne ; it is also, on the whole, healthy for animals. The result is that the animals have food all the year round, they can be out of doors with little or no attention, and so they produce beef cheaply ; the cost has been estimated at about 20*s*. per cwt. all the year round as against English costs of 30*s*. per cwt. in summer on the " extensive " system, and 75*s*. in winter on the " intensive " system. Further, the chilling process is so well developed that the quality of the meat is preserved during the 21-day steamer journey and the meat is delivered in good condition to the consumers in this country.

Another point of considerable importance is the disappearance of the United States as a source of beef. Before the War some 40 to 50 per cent. of our imports were from the United States ; now we receive practically none. This is partly the result of greater consumption in the States—where, as here, much more beef is eaten than any other kind of meat—partly also it results from financial factors.

Mutton. In regard to mutton there has been no great change in source of supply since pre-war days. New Zealand still easily heads the list, sending practically half of all that comes from overseas. Australia is pushing ahead and has increased her contribution, but nothing yet appears likely to threaten New Zealand's supremacy.

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[1] Including Veal, 0·7.

CHIEF MUTTON IMPORTS.

	Million cwt.	
	1931.	1932.
New Zealand	3·47	3·92
Argentina	1·55	1·38
Australia	1·53	1·16
Uruguay	0·28	0·16
Other supplies	0·46	0·53
Total Imports	7·29	7·15
Home Production (Great Britain) 1931/2		5·4

Bacon. The imports of bacon have enormously increased, but the sources have changed; the United States, formerly our chief supplier, has practically ceased to count, while Denmark, which came second on the list, is now a long way first, sending two-thirds of all our imported supply. Another and interesting new feature is the emergence of Poland as an important supplier of bacon; Lithuania is also a new entrant into the market.

CHIEF BACON IMPORTS.

	Million cwt.	
	1931.	1932.
Denmark	7·34	7·67
Poland	1·08	1·14
Netherlands	1·00	0·97
Sweden	0·58	0·43
Lithuania	0·36	0·52
Other supplies	0·78	0·85
Total Imports	11·14	11·58
Home Production	6·5	

Dairy Produce. The changes in source of supply of butter and of cheese have been only small, but the changes in output of some of the countries have been very great. For butter Denmark still heads the list and Russia has fallen off considerably relative to other countries, though not in absolute amount, especially when allowance is made for frontier changes. The second place is now being taken by New Zealand, whose output has vastly increased. Denmark sends us no cheese, New Zealand is unique in sending us large quantities of both. The difference becomes more marked when the quantities are expressed in terms of milk used in the manufacture. Canada has lost ground and the United States disappears from the list of suppliers. Italy has come in and further changes may be expected.

CHIEF IMPORTS OF CHEESE.

	Million cwt.	
	1931.	1932.
New Zealand	1·73	1·85
Canada	0·71	0·75
Netherlands	0·17	0·17
Italy	0·13	0·11
Other supplies	0·15	0·13
Total Imports	2·89	3·01

Home Production (Great Britain) 1931/2 . Figures not available.

CHIEF IMPORTS OF BUTTER.

	Million cwt.	
	1931.	1932.
Denmark	2·47	2·58
New Zealand	1·93	2·19
Australia	1·56	1·83
Finland	0·25	0·22
Argentina	0·37	0·39
Sweden	0·21	0·18
Russia	0·40	0·32
Other supplies	0·86	0·74
Total Imports	8·05	8·45

Home Production (Great Britain) 1931/2 . Figures not available.

Eggs. In pre-war days the sources of supply were restricted by transport, but this limitation is fast being overcome and we may in future obtain supplies from very distant lands. Already China sends an appreciable quantity. Denmark heads the list, having ousted Russia completely. Germany and France disappear as important sources of supply. Poland is apparently, but not really, a new source; in pre-war days Polish eggs were entered as German or Russian.

SOURCES OF SUPPLY OF EGGS.

	Millions.	
	1931.	1932.
Denmark	906	768
Netherlands	460	168
Poland	322	126
Belgium	249	190
China	180	102
Other supplies	994	944
Total Imports	3,111	2,298

Home Production (Great Britain) 1931/2 . . 3,981

The total of imports plus home production does not in any one year give the total consumption: there are always changes in stocks. Over a period of years, however, the imports plus home production balance the consumption. The figures for import show the magnitude of the market which the British farmer misses, and it is for the agricultural experts to see how far this might be captured.

SOIL RESOURCES OF THE EMPIRE.

The organization of food production now taking place throughout the Empire as a result of the recent preferential arrangements has directed attention to the need of a survey of Empire soil resources. No official arrangements have yet been made, but in most parts of the Empire surveys are in progress and a Committee of the British Association was set up in 1931 to co-operate with the Imperial Bureau of Soil Science in collecting and collating the material already available so as to prepare the ground for the larger systematic survey that will ultimately be needed. The work is being done mainly by some of the Schools of Geography of the English and Scottish Universities, and it includes the preparation of rainfall and vegetation maps which will be needed to check and to explain the soil maps.

Of the various parts of the Empire Australia is probably the most advanced in the preparation of soil maps, thanks to the energy and organising ability of J. A. Prescott, of the Waite Institute. His preliminary map is being further developed and it constitutes a framework about which surveys of any desired detail can be elaborated (Ref. 3). In Canada soil surveys are well in hand, and a group of soil workers has been organized under Dr. E. S. Hopkins by the Canadian Society of Technical Agronomists which promises to push the work well forward. The results are being collated by A. H. Joel, who is preparing a soil map of Western Canada as the material becomes available (Ref. 4).

The prairie soils were first examined by Dr. F. T. Shutt, whose pioneering investigations revealed the high content of nitrogen, of phosphoric acid and of potash in the samples examined, but showed also that the nitrogen content rapidly fell once cultivation began (Ref. 5). These investigations have been greatly extended in Manitoba by J. H. Ellis, in Saskatchewan by A. H. Joel, and in Alberta by F. A. Wyatt, all of whom are making surveys on modern lines, and in sufficient collaboration to ensure uniformity of treatment. Ellis has made a detailed survey of the soils of the famous Red River Valley which shows the great advantage of the systematic as compared with the occasional sampling that alone was possible for the earlier workers. The soil of the whole valley is dark coloured and rich in clay, but it is not necessarily all rich in organic matter. The top layer (3 inches) may contain 0·6 or more per cent. of nitrogen, but below that the percentage is only 0·2 or 0·3, falling steadily with increasing depth to 0·06 or less. Periodically, however, the black surface layer has intruded into the lower depths, probably as the result of a shrinking and cracking of the clay, and at these intrusions the nitrogen content of the top three inches may be maintained to a depth of 9 or even 12 inches (Ref. 6).

The basis of the Red River soils must therefore be regarded as the dark coloured clay, and to this special interest attaches. At first sight, judging by its appearance, its stickiness and its slipperiness when wet (demonstrated whenever one tries to motor along a prairie " dirt " road in wet weather), one would at once say that it is a sodium clay, but Ellis's analyses do not accord with this view; instead they show that the dominant base is magnesium.[1] So far as the writer knows this is the first instance recorded of a natural magnesium clay occurring in any important quantity and it is exceedingly interesting that this clay resembles a sodium clay far more than it does a calcium clay. Both here and in Saskatchewan the soils are of the solod and solonetz type.

Coming further east, the soils of Ontario have been examined by Lohse and Ruhnke. These soils are podsolized, though in the southern part of the province the process has not gone very far; it has, however, often gone far enough to affect the distribution of the phosphoric acid (Ref. 7). Still further east, in Quebec, there is a higher rainfall and much of the land was originally under forest. Here many of the soils are more definitely podsolized and are distinctly acid with a high lime requirement (Ref. 8). Similar soil types are found in the Maritime Provinces (Ref. 9).

A soil survey has more recently been started in British Columbia. As a result of these various surveys there is gradually accumulating a large amount of precise information about the soils of Canada which cannot fail to be of great value for the future development of Canadian agriculture.

In Scotland the soil survey is centred at the Macaulay Institute, Aberdeen, and is therefore carried out on consistent and coherent lines; mineralogical and other analyses are made whenever necessary, and the whole is linked up with the advisory work (except for the Edinburgh province). In England, on the other hand, the soil survey work was left in the hands of the counties and in consequence the treatment of the different areas lacks uniformity. Some have been fairly fully surveyed: others, equally important, have not; in any case, the results are not usually available in published form. For the Wye College surveys their Journal affords a medium for publication. Furneaux has recently issued his account of the soils of the High Weald of Kent (Ref. 10).

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[1] J. H. Ellis, Private Communication. Curtailments of grants have unfortunately delayed the publication of this important survey.

METHODS OF SOIL SURVEYING.

All this activity in soil survey has led to improvements in the way of carrying out a survey. The older methods were based on soil analysis, but this proved unsatisfactory. It is now recognized that the basis of the survey must be the soil profile (Ref. 11). This, however, gives only a very general classification and more detailed methods are needed in actual practice. Chemical and mechanical analyses are needed for all type samples and much work is being done to ensure greater uniformity in procedure. G. W. Robinson has mechanically analysed 120 soils from this country and various parts of the Empire with the view of improving the method (Ref. 12), but for the numerous field samples it proved so tedious that more rapid methods had to be devised. A much simpler method was then adopted based on the texture of the soil: the surveyor felt the soil with his fingers and after some practice was able to put it into one of eight or ten groups varying from very heavy and sticky to very light. This, however, is such a personal matter that it can hardly satisfy modern requirements. A more precise method, based on actual measurements, has been devised by R. K. Schofield and G. W. Scott Blair at Rothamsted (Ref. 13). An instrument called the Pachimeter was made which measures the "heaviness" of the soil by the weight required to cause a permanent lengthening of a small cylinder of moist soil of known dimensions when rolled backwards and forwards between glass plates. The method is both rapid and simple, and it gives concordant results. It has the advantage that the soil need not be dried or sieved so that it is subjected to no treatment liable to disturb its texture. The values obtained are closely related to the drawbar pull in ploughing for single fields and to clay contents for groups of closely related soils, and they offer perhaps the best method yet known for expressing numerically the heaviness of a series of soils.

Other properties besides heaviness are, however, important, and several soil investigators, prominent among whom have been B. A. Keen and his colleagues at Rothamsted, have for the past few years studied a number of simple properties, any of which might be used by the surveyor in characterizing soils. A number of these methods have been applied by J. R. Coutts (Ref. 14) to an extensive range of soils, and the data have been statistically examined by E. W. Russell (Ref. 15) so as to find out which methods give the most useful information.

SOIL TILTH.

Considerable attention is being paid to the meaning of soil tilth and the factors concerned in crumb structure. One of the important properties of the soil crumbs is their stability towards water; crumbs that will persist when moist are much more conducive to productiveness than crumbs which readily break down. Stability depends on the composition of the clay; it is greater for a calcium clay than for others, and it is enhanced by micro-organic action, apparently through the formation of a film on the surface.

Crumb formation in soil (Ref. 16) and its related phenomena are due to interaction between the clay particles and the water present, and methods are being developed to elucidate the details of this interaction. By comparing the properties of clays dispersed in water and in organic liquids it is possible to pick out those particular properties of the water and organic liquid molecules responsible for any given property of the dispersion. Thus crumbs can be formed from clay dispersed in the alcohols, aniline, and nitrobenzene, but not from clays dispersed in a hydrocarbon; indicating that their formation depends on the presence of certain kinds of chemical groups in the liquid (Ref. 17).

SOIL MANAGEMENT IN SEMI-ARID REGIONS.

Much work continues to be done in semi-arid regions on the proper way of cultivating the soil. Three purposes have to be achieved:

(1) the moisture must be conserved;
(2) the weeds must be suppressed;
(3) the drifting or blowing of the soil, so common in semi-arid regions, must be checked.

It has long been known that a summer fallow is the best way of achieving the first two purposes but there has been much discussion as to the most effective procedure. For long it was supposed that the two purposes were distinct: the saving of soil moisture was regarded as something fundamentally different from the control of weeds. The old idea was that a fine mulch should be kept on the surface and stirred frequently so as to break the water films surrounding the particles and check the upward movement of water to the surface. This view is now generally discarded. Experiments in conditions as widely separated as Rothamsted, Illinois and Western Canada show that nothing is gained, and something may even be lost, by carrying cultivation beyond the point when the weeds are kept down (Ref. 18). So far as present evidence goes, if the cultivator keeps down the weeds he has gone as far as he can in saving the soil moisture. At present, therefore, no distinction is generally recognised between weed control and moisture conservation.

The Experiment Stations at Swift Current and at Regina in the semi-arid region of Saskatchewan are largely devoted to the study of cultivation problems. The average total precipitation (rain and snow melted so as to count as rain) is 15·2 inches as compared with 29·3 inches at Rothamsted, but the range is from 9·7 to 24·5 inches. For the four growing months April to July the average rainfall is 7·9 inches—which is not far from the Rothamsted rainfall of 9·1 inches during the same period.

There is, however, an enormous difference in the rate of evaporation, which in the semi-arid region is so high that much of the rainfall is likely to be lost.

Wheat is more drought-resistant than grasses and clovers, and at Swift Current the earlier maturing varieties are more drought-resistant than the later varieties except when drought occurs unusually early in the growing season. In favourable years the wheat has required about 1,000 lb. of water for each lb. of grain: this is a usual figure and corresponds with about 500 lb. of water for each lb. of total dry matter. In unfavourable seasons up to 3,000 lb. of water has been needed per lb. of grain (Ref. 19).

A characteristic feature of harvest time is exhaustion of the soil moisture. This takes some time to replace as water does not percolate to lower depths until the top soil has become moist, and during this process much water may be lost by evaporation. Much of it, however, can be saved by summer fallowing and suitable cultivation; the saving may amount to some 20 to 30 per cent. and in consequence the wheat crop after a fallow is usually distinctly higher than after a previous wheat crop (Ref. 20). Usual results are somewhat as follows:—

	Bushels per acre.
Wheat after a summer fallow . .	20–22
Wheat after stubble	12–14

but with considerable variation from season to season.

A three-course rotation is therefore adopted: summer fallow: wheat: wheat and some oats. The rainfall is insufficient for grass or clover and the horses are fed on the oats which are harvested partly as hay and partly as ripe grain.

Where windbreaks are possible other crops can be grown and a considerable variety of vegetables can be found in the farm gardens protected by hedges of Caragana, a leguminous shrub which tolerates the dry conditions. Summer cultivation needs to be done intelligently. If overdone there is not only financial loss, which in these days is very serious, but worse still the soil may under the intense summer heat and dryness become so powdery that it easily blows away. No one who has been in a dust storm on the prairie is ever likely to forget it or to need telling that wind erosion is a serious source of loss on cultivated soils. Many observers fear that these wind losses are on the increase, and that the prairie farms are in consequence decreasing in fertility. Much experimental work is now being done in Canada to discover ways of reducing these losses. One of the most promising is to find how to reduce cultivation to the minimum and to avoid breaking down the soil too finely. It is found that heavy soils need not be ploughed : the one-way disc, the rod-weeder and the cultivator usually do what is necessary. When ploughing has to be done the disc plough is used, not the mould-board plough. The important thing is to leave the stubble on top so as to stop drifting and also (though this is perhaps less important) to hold the snow in winter. On some farms the fallowing is done in strips alternating with cropped land so as to reduce the mass effect of the dust storm in breaking up the soil. Alternating strips of grain and fallow, from 10 to 20 rods wide, are set out as nearly as can be at right angles to the direction of the severest winds. The fallow strips are left as rough as is practicable : the cultivation is with the harrow or duckfoot cultivator : straw or stubble is left on the fields (Ref. 21). The ideal treatment would of course be to restore the fibrous organic matter which in natural prairie conditions held the soil together and reduced (though it could not altogether prevent) the wind erosion, but no suitable way of doing this has yet been found. On very light soils which are especially liable to blowing, summer fallowing is avoided and the land is cropped continuously with winter rye, then oats or spring wheat. But this method stakes everything on the chance of a favourable season, which by no means always comes. The light soil farms are therefore usually poor.

The necessity for reducing cultivation to a minimum, and the conviction that moisture conservation is intimately bound up with weed control, have given a considerable stimulus to the study of this problem. A comprehensive investigation has been started by the Agronomy Departments of the Manitoba Agricultural College and the University of Saskatchewan. Spraying methods of control, especially with 4 per cent. sulphuric acid, appear quite promising (Ref. 22).

These weed treatments are very important between the two wheat crops, and one method that has given good results is to burn the stubble of the first crop in April or May and then to harrow in the seed of the second. This, of course, is against the old teaching, but it still remains to be seen what part soil organic matter really does play in a dry region.

Various attempts have been made to substitute tilled crops for summer fallow: the best of these at Swift Current proved to be maize, potatoes and sunflower, grown in rows so that cultivation implements could keep down the weeds. At Saskatoon oats grown in double rows spaced three feet apart responded well to cultivation, and over a period of ten years the succeeding wheat crop, though not as good as after a summer fallow, was nevertheless satisfactory and the value of the wheat and the oats was much greater than that of wheat after fallow (Ref. 23). Under low rainfall, however, the fallow is better than the tilled crop.

The cultivation between the two wheat crops presents some difficulty. Early autumn ploughing gives good results, but is not usually feasible owing to rush of harvest work. Late autumn ploughing may give lower yields than spring ploughing, yet spring ploughing if delayed leads to delayed sowing and reduced yields. Hence autumn ploughing is the safe course to follow and if it cannot be done early a rapid cultivation just after harvest minimizes the disadvantage of the late ploughing (Ref. 24).

FERTILIZERS ON SEMI-ARID SOILS.

In the semi-arid regions of Australia and South Africa it has long been recognized that fertilizer treatment is necessary, superphosphate being especially beneficial. For long it was supposed that Canadian soils behaved differently and gave no response to fertilizers. Experiments confirmed this so long as the fertilizers were broadcasted in the usual way. It is now shown, however, in Saskatchewan and elsewhere that superphosphate, or better still ammonium phosphate, *drilled in with the seed*, gives notable increases in the yield of wheat. Small quantities only are needed, some 35 to 40 lb. of ammonium phosphate being sufficient, and the increased yield may be about 6 bushels of wheat. The fertilizer is made by the Consolidated Mining & Smelting Company of Trail, British Columbia[1], and it is applied in a combined seed and manure drill.

Now that this supposed exception is shown to fall into line with other results a general rule emerges fairly clearly. In humid regions nitrogenous fertilizer is the most effective for grain crops, and indeed for most other crops as well, but for full action it requires to be supplemented by phosphate and potash. In semi-arid regions on the other hand phosphate is the most effective fertilizer for grain crops and it does not need supplementing by nitrogen or potash (Ref. 25).

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[1] The manufacture began in 1931 and was stimulated by the circumstance that sulphur fumes previously discharged into the air had to be rendered innocuous. The manufacture of superphosphate enabled this to be done.

An interesting zonation has been worked out for wheat by J. H. Ellis[1] for Manitoba showing how the fertilizer requirement changes with increasing moisture supply. On the black earths of the semi-arid south-west the only response is to phosphate. On the soil in the somewhat moister east and north the response is to phosphate with some nitrogen. On the moister and more podsolized soils of the north the response is more markedly to nitrogen, but phosphate is also needed and in some areas potash also. The potash question may always need further study in view of the work of Vageler and Alten (Ref. 26).

The Russian chernozem soils were also considered too rich to need fertilizers: this question has recently been reopened (Ref. 27).

SOIL EROSION.

A further difficulty about cultivation in semi-arid regions is that rain, when it comes, is often torrential, so that it washes away a good deal of the soil. This problem has been much studied in the United States, where some 11 million acres of farm land have already had to be abandoned owing to damage by soil erosion. Special research stations have therefore been set up to deal with it. The present position has been recently summarized by T. Eden (Ref. 28). The erosion takes two forms: sheet erosion which goes on slowly and evenly over a large area, and gulley erosion which is more localized and washes out the soil into great gulleys or ravines. The important factors at work are:

(1) The effective rainfall, *i.e.* the rain that runs off carrying soil with it. This is not the same as the total rainfall: at Spur (Texas), for example, where serious erosion losses occur, the average annual rainfall is only 21·7 inches, yet many other places of much higher rainfall do not suffer so much.

(2) The vegetation cover. Erosion under cultivated crops is roughly about eight times greater than under forest or undisturbed natural vegetation. Duley and Miller (Ref. 29) in Missouri find that soils under annual crops suffer from erosion because at some period they are virtually fallow; in particular soybeans and maize gave little protection, the annual loss of soil averaging 21 and 25 tons per acre as compared with sod and a crop rotation, which lost only 0·25 and 3 tons per acre respectively.

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[1] Regina Conference Papers 1933, p. 40.

The efficiency of a forest cover in preventing erosion is attributed in part to the high water-holding capacity of the litter, though Lowdermilk (Ref. 30) concludes that the litter fulfils a more important function in preventing the silting up of the soil pore space by the washing down of the finer soil fractions, a process which hinders rapid drainage, and, in consequence, increases run-off water. Similarly, cultivations reduced erosion by facilitating drainage, though in many of the erosion experiments the nature and properties of the soil masked this effect.

(3) The effect of gradient. The velocity of run-off, and therefore its transporting power, naturally increases with the increase in slope of the land, but the amount of erosion depends also on the type of soil. Clay soils erode more than sandy soils at low gradients, but less at gradients above 15 per cent. Bennett (Ref. 31) classifies soils as erosive and non-erosive on the basis of the SiO_2/Al_2O_3 ratio of the soil clay, but no such simple criterion is as yet accepted.

Good methods of prevention are: the encouragement of ground cover, *e.g.* the planting of cover crops of leguminous plants in tropical countries, the levelling of sites, the construction of barriers to break the velocity of run-off water, and, in hill districts, the terracing or ridging of the land, are the best preventive measures. On grassland, overgrazing considerably increases the erosion losses.

COMPARISON OF ARID AND HUMID CONDITIONS.

The management of soils in semi-arid regions is thus entirely different from their management in humid conditions. In the semi-arid regions the soils tend to be alkaline, therefore lime is never required. The plant nutrients are not as a rule washed down, so that deep ploughing is not necessary. The surface soil tends of itself to form a mulch on the surface and the process may go so far as to form a powdery dust that easily blows away, causing serious soil loss : cultivation therefore is not needed to break down the soil but rather to keep down the weeds ; indeed the soil must be kept in such state as to impede the natural mulching process. Organic matter apparently does not serve the same purpose as in humid regions[1] ; green manuring and farmyard manure both appear to be unnecessary, while of the other fertilizers phosphate is the most effective, the need for nitrogen being much less than in humid regions. Summer fallow is essential and the rotation usually has three courses: fallow, grain, grain.

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[1] For a recent study of organic matter and soil fertility see A. I. Achromeiko, *Zeit. Pflanz. Düng.*, 1933, Vol. 30, p. 98, and *Landw. Jahr.*, 1931, Vol. 74, p. 713.

Canada has the great advantage that its cultivated area extends from the arid in the western prairies, with chernozem, solonchak and solod soils, through all shades of semi-arid conditions, and ends up with distinctly humid conditions with podsol soils in the east and north. The change in management necessitated by these changes in moisture supply is well illustrated by comparing Drs. Hopkins and Hopper's eastern bulletin with those issued for the west (Ref. 32).

In order to study the various cultivation and fertilizer problems a chain of experiment stations has been set up across the country to repeat some of the Ottawa experiments under different conditions of soil and climate: the results are summarized in the respective reports (Ref. 33). The experiments include several different rotations, schemes of manuring (Ref. 34) and time of application of farmyard manure, and, at St. Ann de la Pocatière, a comparison of open drains with underdrainage.

SOIL CULTIVATION.

The Rothamsted experiments on the effect of cultivation processes on the soil are still continuing. Practical men have long claimed that light land could be kept in arable cultivation best by the folding of sheep, because their treading had some special effect which could not be reproduced by cultivation implements. B. A. Keen and G. H. Cashen (Ref. 35) show that this treading caused on light land a consolidation that extended some 4 or 5 inches below the surface and reached a maximum about 1½ inches below; further, the effect was not swamped by ploughing, but could be detected several weeks afterwards.

Land Reclamation. Although the financial crisis has lowered the rate at which land reclamation schemes are being advanced it has not stopped the progress of any of the more important of them. The drainage of the Zuyder Zee has still continued and extensive reclamations, mostly drainage schemes, are being pushed forward in Germany, helped greatly by the new subject called "Kulturtechnik," the exponents of which have devised rapid methods of assessing the relative suitability of the various methods of drainage to the particular area in hand. These are discussed by H. Janert (Ref. 36), one of the best of the workers on this subject, in a recent publication of the Imperial Soil Bureau. He has developed a simple test, the heat of wetting, for showing the probable distance apart and depth of drains likely to give the best result for a given soil.

The Italian schemes were recently described by A. D. Hall (Ref. 37) and by the Imperial Soil Bureau (Ref. 38); they are part of the organized development known as "Bonifica integrale" now being carried out under the Fascist régime. The purpose of the work is to improve rural conditions and to settle permanently on the land a larger number of workers and their families, thus intensifying agriculture and checking the movement of population from the country to the town. The work was complicated by the widespread prevalence of malaria, which had played an important part in driving people off the land and causing fertile arable tracts to be reduced to winter grazing land. One large scheme is to the north of the Tiber around Maccarese on the main line to Pisa. Six years ago it was marsh, now 20,000 acres have been reclaimed and brought to the crop-bearing stage: some had to be drained and some irrigated. The chief product is milk for Rome; the crops include maize, oats, barley and lucerne, while nearer the sea, where the blown sand has lightened the soil, vegetables, fruit and especially vines are grown—already there are some 1,500 acres of vines. The cattle are being improved, horses are being bred and poultry developed. A new village has been built, the region which in 1925 maintained only 50 people, all malarial, now has 4,000, shortly to be raised to 8,000, and malaria has been greatly reduced. The output has been raised from less than 1·5 million lire in 1925 to 19 million lire, and is expected to rise to double this amount.

A larger and more important scheme, but not yet so advanced, is the draining of the Pontine Marshes, a great area of wet land situated in the plain that lies south of Rome and towards the Mediterranean Sea. Many attempts have been made in the past to reclaim these marshes, but without success. The trouble lies partly in the rapid rush of water from the hills in winter and spring, partly from the high water level normally occurring in the soil. The reclamation involved three separate series of works. The hill water was prevented from running on to the lower land: instead it was led into a great reservoir of 20 million cubic metres capacity and there stored for irrigation and for generating electricity: a hydro-electric power station was set up capable of generating 1,000 horsepower, sufficient to supply the whole countryside with current. The low land was drained by open ditches and drains leading into main channels, but as the land lies low and the Mediterranean Sea is tideless, it was not possible to let the water flow out by gravity at low tide as is usually done in England: instead, the water has to be pumped out.

Malaria was stamped out by flooding the whole area with sea water: this killed all the marsh-land vegetation and so destroyed the breeding places of the mosquitoes. Some 180,000 acres are being reclaimed; part has already been drained and converted largely into small holdings for the cultivation of cereals, leguminous crops, grapes, carnations and other crops including grass. Not only is this additional land a source of new wealth, but the extermination of mosquitoes has greatly improved the agriculture of the surrounding regions.

Other parts of the scheme include afforestation in the mountains, and the setting up of fresh-water lakes for the development of a fresh water fishing industry.

One cannot help regretting that work of this sort is not done in England. We have the land, the technical skill and the unemployed men already largely maintained at the public expense ; some at any rate of them could probably make good in settlements where they could produce their own food and sufficient margin to maintain those supplying their other needs.

An attempt is being made in Scotland to do something of the same kind, but on a much smaller scale. Thanks to the generosity of Mr. T. B. Macaulay, who set up the Macaulay Institute for Soil Research at Aberdeen, a farm has been established on the peat near Stornoway, in Lewis, where reclamation experiments are being tried : this is the only peat culture station in Great Britain. The main work at present (Ref. 39) is to increase the supply of milk, and this is being done by establishing grass and increasing the supply of other fodder crops. It is too early to expect results, but the work already done is promising, and there is every indication that the crofters will benefit considerably by it.

Fallowing. Further studies of the effect of fallowing on the suppression of weeds have been made by W. E. Brenchley and K. Warington (Ref. 40). Perennial weeds, coltsfoot (*Tussilago farfara* L.), horsetail (*Equisetum arvense* L.), field sowthistle (*Sonchus arvensis* L.) and creeping thistle (*Cirsium arvense* Scop.) were all satisfactorily dealt with by fallowing. Annual weeds presented greater difficulty. Seeds of most weeds can lie dormant in the soil for a year or more even though the conditions are made favourable for germination: for some seeds this period of dormancy is long; knot grass seeds, for instance, (*Polygonum aviculare* L.) have persisted at least five years in the soil at Rothamsted, and against this a single fallowing is ineffective. Other seeds will germinate only at a certain period of the year: knot grass and *Atriplex patula*, for example, germinate only in early spring and therefore are unaffected by autumn cultivations. Others such as shepherd's purse (*Capsella bursa-pastoris* D.C.), thyme-leaved sandwort (*Arenaria serpyllifolia* L.) and field speedwell (*Veronica buxbaumii* Ten.) germinate easily in autumn and early winter and produce seed so easily that they can apparently restock the land easily in the intervals between cultivation: these therefore are not much reduced by fallowing. Finally, another group is easily dealt with by fallowing because of the ease with which the seeds germinate: this includes poppy (*Papaver* spp.), black bent (*Alopecurus agrestis*) and black medick (*Medicago lupulina*).

Part of the remarkable benefit of the fallowing is associated with an increase in supply of soil nitrates: this is shown by the circumstance that much of the advantage is lost by supplying nitrate.

SOIL TREATMENT AGAINST FUNGUS AND INSECT PESTS.

D. J. MacLeod and J. A. Howett (Ref. 41) report that they have been able to control potato scab (*Actinomyces scabies*) and club root of turnips (*Plasmodiophora brassicae*) by adding to the soil in the rows 15 lb. per acre of mercurous or mercuric chloride. To facilitate distribution the mercury salt is mixed with four times its weight of inert material such as fine soil.

Phosphatic fertilizers are found by K. M. King and A. P. Arnason (Ref. 42) to help wheat overcome the attack of wireworm (not the English sort but species of the genus *Corymbites* which, however, are not very different in their appearance and behaviour) in the semi-arid regions of Saskatchewan. The effect is not on the wireworm but on the crop, but it added from 30 to 100 per cent. increase in yield.

FERTILIZERS.

The serious financial plight of farming during 1932 and early 1933 is best shown by the fact that the agricultural index number for March 1932 was 102 as compared with 100, the average for the three years 1911–1913, while costs of production, particularly labour, were considerably above the 1911–13 level. It might have been expected that fertilizer consumption would have greatly fallen off: actually it has not, though there have been some marked changes.

An interesting summary of the position has been prepared by Mr. A. N. Gray of the Fertilizer Manufacturers' Association. Starting from 1926, which may be regarded as the first "normal" year after the War, the consumption of nitrogen has steadily risen, that of potash has fluctuated (it reached its highest point in 1929 but in 1932 it fell to its lowest point), while that of phosphoric acid, which also had risen to a high level in 1929, also fell to the lowest point.

Nitrogenous fertilizers. The 1932 consumption in Great Britain and Ireland reached the record value of 58,200 metric tons of nitrogen: of this, 84 per cent. was in the form of sulphate of ammonia: 9 per cent. in the form of nitrate of soda and the remaining 7 per cent. as various synthetic fertilizers; these latter are steadily increasing. Prior to this the previous record had been 1929, after which there was a fall in 1930 and a further fall in 1931. The consumption in the years since 1926 has been as follows :—

GREAT BRITAIN AND IRELAND—NITROGEN CONSUMPTION[4] 1926–1932. METRIC TONS.[5]

Year.	Nitrate of Soda.	N.	Sulphate of Ammonia.	N.	Other Synthetic Nitrogen[3] Fertilizers. N.	Total Nitrogen.
1926[1]	49,350	7,650	171,348	35,983	517	44,150
1927[1]	33,528	5,197	172,049	36,130	1,023	42,350
1928[1]	37,600	5,827	170,404	35,785	1,538	43,150
1929[2]	50,300	7,795	189,697	39,836	2,219	49,850
1930[2]	48,770	7,559	186,452	39,155	2,686	49,400
1931[2]	45,720	7,315	168,467	35,378	3,257	45,950
1932[2]	33,528	5,364	231,990	48,718	4,118	58,200

In other countries also there has been a marked rise in nitrogen consumption since 1925, but with a break in the last few years. In an interesting review of this problem Dr. Ahlgrimm (Ref. 43) shows that the European consumption reached a maximum in 1928–9 and then fell till 1931–2 though it started rising again in 1932–3: the world consumption reached its maximum a little later. The figures are in thousands of metric tons of pure nitrogen :—

	1924–1925	1925–1926	1926–1927	1927–1928	1928–1929	1929–1930	1930–1931	1931–1932	1932–1933
Europe[6]	730	740	855	938	1074	1051	886	924	949
Other Countries	400	439	437	577	654	694	587	503	562

The interesting result emerges from this table that Europe, although having only 20 per cent. of the cultivated area of the world, is responsible for about two-thirds of the world's consumption of nitrogen. Comparison with the last table shows that Great Britain and Ireland account for only about 5 or 6 per cent. of the European consumption: this is partly on account of our small area but also because we use less per acre of nitrogen from artificial fertilizers than many other countries: much of our nitrogen comes from imported animal foods. The consumption of nitrogen (as N) from artificial

[1] Years ending May 31. British Sulphate of Ammonia Federation Report.

[2] Years ending June 30. British Sulphate of Ammonia Federation Report.

[3] Fertilizers other than sulphate/ammonia and nitrate/soda. (Imp. Chem. Industries.)

[4] Sulphate of ammonia from all sources is included under this heading. Agricultural consumption only.

[5] 1 metric ton = 2,204·6 lb.

[6] Russia is not included in Europe but in "other countries."

fertilizers is, in lb. per acre of land used for agriculture (crops and grass):—

	Lb. Nitrogen per acre per annum.
Belgium and Holland	25–30
Denmark and Germany	8–12
England, Czechoslovakia, France, Italy, Norway, Sweden, Spain	2–5
Austria, Switzerland, Poland, Finland, Greece	0·7–1

In some of these countries the increased consumption has been very marked. Since 1913, for example, the Danish consumption has quadrupled, the Dutch and Spanish have trebled, while the German, French and English consumptions have doubled.

In Europe as in England sulphate of ammonia is used far more largely than any other fertilizer, the percentages of the total nitrogen consumed being :—

	Ammonium Salts.	Nitrate of Ammonia.	Nitrate of Soda and of Lime.	Cyanamide.	Total.
1924–25	51	9	27	13	100
1928–29	41	15	28	16	100
1931–32	48	16	23	13	100

Here again, however, the different countries vary : the British figures have already been given : Norway, Sweden, Denmark and Finland use 50 to 80 per cent. of their nitrogen as nitrates : England, Holland, Belgium, Spain and Portugal use 75 to 90 per cent. as ammonia and cyanamide. France and Italy come in between with 55–70 per cent. of their nitrogen in the form of ammonia and cyanamide. Germany, Poland, Austria and Czechoslovakia use 30–35 per cent. of their nitrogen as nitrate of ammonia.

Dr. Ahlgrimm considers that the European consumption of nitrogen is bound to increase : it is the only way of carrying out the fixed intention of European countries to be agriculturally self-supporting, and it offers the only way of competing with the cheap grain grown with the use of much machinery on the prairies: indeed "Nitrogen v. The Combine" has become somewhat of a catchword among German agriculturists.

The ammonium nitrate referred to above is the essential constituent of nitro-chalk, now well known in this country.

Cyanamide was till comparatively recently the cheapest source of nitrogen, and it is widely used in countries of intensive farming and small-scale market gardening.

Care has to be taken in its use but it has the compensating advantages that it destroys weeds and certain insects and that it supplies lime. Some of the earlier experiences with it in Great Britain were none too happy and in consequence a certain prejudice was created against it. The whole question has been fully investigated at Rothamsted (Ref. 44).

In all the soils studied the initial decomposition to urea and ammonia was complete in a few days, the rate increasing with the concentration of the cyanamide in the soil solution and with the intensity of microbiological activity in the soil. The harmful effect of cyanamide on seeds and seedlings is due to the cyanamide itself and not to any decomposition product. The harmful effect on nitrifying organisms causes the decomposition to stop at ammonia, which, however, is normally available to plants so that the lack of nitrate is not serious. The harmful effect on soil organisms soon passes and one then obtains the normal partial sterilization effects, an increase in bacterial numbers and also in carbon dioxide production in the soil. The experiments did not support the view that dicyanodiamide is specially harmful: indeed, contrary to the earlier results some evidence has been obtained that it may in special circumstances be a source of nitrogen to plants (Ref. 45).

PHOSPHATIC FERTILIZERS.

During 1932 the consumption of phosphatic fertilizers in Great Britain and Ireland fell off considerably and reached the lowest level recorded since 1926. This is the third successive year of the decline, the maximum since 1926 having been attained in 1929: even this, however, is below the pre-war level. Superphosphate is by far the most important phosphatic fertiliser, accounting for 55 to 60 per cent. of the phosphoric acid used here. In England and Wales the popular grades are the 14 and 16 per cent., in Scotland and Ireland the 16 and 18 per cent.: the average grade works out at 15–35 per cent. (Ref. 46). Basic slag has shown more variation in consumption than superphosphate, its highest level being reached in 1929 with 327,000 metric tons, and its lowest in 1932 with 155,000.

Other phosphatic fertilizers, bones, mineral phosphates, etc., form less than 20 per cent. of the total, but they also show a marked falling off since their peak year of 1929.

The activity of the Ministry of Agriculture Basic Slag Committee has been considerably curtailed and it will probably soon come to an end. Broadly speaking, the results of the experiments show that citric solubility is a valuable means of classifying slags but not of comparing slags within a given class. Commercial slags fall into two groups; those of 75 per cent. or higher solubility in the standard citric acid test, and those of 40 per cent. or less solubility. Slags between 40 and 75 per cent. solubility rarely, if ever, occur on the market. The high soluble slags have distinctly greater value than those of low solubility: indeed, frequently in the tests the low soluble slags have not been worth buying. Within either group, however, the solubility is no guide to the manurial value: a slag of 75 per cent. solubility may be equal if not superior to one of 80 per cent. solubility. All slags, whether of high or low solubility, have a lime value equal to their own weight of calcium carbonate.

The Rothamsted field experiments have shown clearly that sodium silicate facilitates the uptake of phosphate by the plant and numerous attempts have been made to put this discovery to practical use. It has been supposed that the addition of sand in the converter increased the citric solubility of the resulting slag but this does not appear to be so; on the other hand the sand had various undesirable effects: it increased the consumption of manganese, interfered with the removal of sulphur and made the slag more viscous (Ref. 47). The addition of kieselguhr to superphosphate during its manufacture is claimed to have increased its effectiveness slightly, at any rate in pot experiments, but it remains to be seen whether field experiments would show any advantage (Ref. 48). In spite of many attempts we cannot say that this problem of enhancing the effectiveness of phosphate by means of silica has yet been solved.

The figures for consumption of phosphate in Great Britain and Ireland are, in metric tons per annum:—

GREAT BRITAIN AND IRELAND–PHOSPHORIC ACID CONSUMPTION 1926–32. METRIC TONS.[3]

Year.	Ground Phosphate, Bones, etc.[1]		Superphosphate.[1]		Basic Slag.[2]		Total P_2O_5
		P_2O_5.		P_2O_5.		P_2O_5.	
1926 .	115,810	33,006	693,238	106,759	265,337	42,454	182,219
1927 .	116,694	33,258	685,489	105,565	165,077	26,412	165,235
1928 .	123,661	35,243	686,616	105,739	161,177	25,788	166,770
1929 .	161,377	45,992	741,832	114,242	326,951	52,312	212,546
1930 .	140,341	39,997	673,757	103,749	310,641	49,703	193,459
1931 .	92,613	26,395	621,519	95,714	218,773	35,004	157,113
1932 .	94,762	27,007	585,319	90,139	155,388	24,862	142,008

The consumption of phosphate has not shown the same increase as that of nitrogen and potash. The figures for Great Britain are as follows (Ref. 49):

PLANT FOOD CONSUMPTION IN METRIC TONS.

	N.	P_2O_5.	K_2O.
1926 . .	44,150	182,219	47,500
1927 . .	42,350	165,235	54,921
1928 . .	43,150	166,770	51,203
1929 . .	49,850	212,546	61,388
1930 . .	49,644	193,459	49,659
1931 . .	45,950	157,113	52,500

[1] Calendar years.

[2] Years ending 31 May. Ministry of Agriculture Committee on Basic Slag.

[3] 1 metric ton = 2,204·6 lb.

The general result holds true not only in England but in Europe also. Everywhere one finds more nitrogen being used and less phosphate. To some extent this is the result of the agricultural depression: nitrogenous dressings help the farmer to cash the reserves of phosphate and potash in his soil and where prices are low and costs high there is some justification for this course. But obviously it cannot continue indefinitely and a number of the Rothamsted experiments show that a serious fall in yield may be expected if the exhaustion is allowed to go too far. Before long the practice of giving more complete dressings must be restored. P. Ehrenburg (Ref. 50) has discussed this question so far as Germany is concerned and concludes that the cutting down of phosphate has now gone too far, and is reducing the yields of sugar beet and increasing the amount of clover sickness.

POTASSIC FERTILIZERS.

The consumption of potassic fertilizers in Great Britain and Ireland also fell off during 1932, and reached a lower level than at any time since 1926. It is not, however, possible to give very good figures as no distinction is made in the statistics between the agricultural and the industrial use of potash: it is estimated that about 85 per cent. of the total consumption is agricultural: on this basis the agricultural consumption has been:—

GREAT BRITAIN AND IRELAND—POTASH CONSUMPTION 1926–1932. METRIC TONS.[3]

Year.	[1]K_2O.
1926	47,500
1927	54,921
1928	51,203
1929	61,388
1930	49,659
1931	52,500
1932	41,100[2]

The German Potash Syndicate has now set up an experiment station at Berlin-Lichterfelde to study the numerous problems associated with the potassic manuring of crops: its equipment has been described by Dr. Eckstein and his colleagues (Ref. 51).

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[1] Calculated K_2O content of retained imports of potassic salts. The consumption figures are therefore total, *i.e.*, agricultural plus industrial consumption.

[2] Estimated.

[3] 1 metric ton=2,204·6 lb.

FERTILIZER REQUIREMENTS OF THE SOIL.

Most farmers purchase fertilizer mainly in the form of mixed or "compound" fertilizer and this practice is no longer as much condemned by agricultural experts as in pre-war days.

There has undoubtedly been an improvement in the condition of the mixtures, and some of the compounds are now very concentrated so that it is unnecessary to handle such large bulks of material as was formerly necessary.

The French experts are discussing the question whether a large number of "compounds" is necessary and E. Roux (Ref. 52) suggests that they might well be reduced to three, containing the plant nutrients in the following proportions :—

Nitrogen (N).	Phosphate (P_2O_5).	Potash (K_2O).
1	1	2
1	2	2
1	1	3

The severe economic plight of farming is causing agricultural experts to study once more the possibility of finding out what quantity of fertilizer a soil requires in order to give it a profitable increase of crop. The question is old and apparently very simple : it is argued that, if a full crop requires so many lb. of nitrogen, phosphate and potash, a chemist ought easily to be able to find out how much of each of these is in the soil and then show how the balance is best supplied by fertilizers. In reality the problem is much more difficult because the plant does not always contain or need the same quantities of materials : there are differences according to season, water supply, depth of soil and other factors : also the compounds in the soil vary and some are more easily taken up than others. In Great Britain the question loses some of its importance on farms where expensive and responsive crops such as potatoes and mangolds are grown and where a good dressing of fertilizer would be given in any case as an insurance against low yields. The residues then serve for other crops and the farmyard manure supplies much of the balance. In many other regions, however, on the Continent and in the United States, these considerations do not apply and farmers are working on such a narrow economic margin that they cannot afford to spend any more money than is absolutely necessary on fertilizers : they are seeking to cover the minimum requirements and leave the rest for better times. Here in Great Britain also the introduction of sugar beet has altered the situation and once more brought this matter into prominence. Four general methods are being tried for assessing the fertilizer requirements of soil.

1. Crops are grown on soils known to be deficient in nitrogen, potash and phosphate and their general appearances are observed. Crops showing these same symptoms are regarded as suffering from shortage of the particular nutrient and the appropriate manuring is therefore recommended. This method has been studied at Rothamsted for farm crops (Ref. 53) and at Long Ashton for fruit (Ref. 54); it works satisfactorily where there is actual starvation but not where there is merely insufficient for full crops.

2. More delicate tests are made on the plant. The tissues are examined by microchemical and other tests so as to detect shortages which are not serious enough to make differences visible to the eye. This method is promising but it has not yet reached the stage of practical application (Ref. 55).

3. Plants are grown on the soil and studied in one of several ways :—

(a) They are analyzed: their uptake of potassium or phosphate is ascertained and compared with that of plants fully supplied with fertilizer. This is the Neubauer method and in the hands of experts it works well.

(b) The plants are manured according to a definite plan and the best response is observed by direct weighing: this is Mitscherlich's method, used in parts of Germany, in Russia and in Scotland.

(c) A micro-organism is grown in the soil and its rate of growth is studied in comparison with that in a soil fully supplied with nutrients. Azotobacter was the one first used: it was applied by Christensen to estimate the lime requirement and phosphate deficiencies of soil; more recently it has been used by J. Ziemiecka and S. Winogradsky (Ref. 56) for indicating general fertility conditions. J. Ziemiecka has made some important studies of the Rothamsted soils (Ref. 57): her method is proving useful in Colorado where phosphate is generally the limiting factor so that complications from other causes do not arise (Ref. 58). Niklas uses Aspergillus as the testing organism for phosphate and potash deficiency and A. M. Smith and R. Coull of Edinburgh (Ref. 59) find this method useful for poor soils, but not so good for richer ones.

4. Numerous attempts have been made to find chemical methods of soil examination which would indicate the response to fertilizer. The older methods were slow; more rapid ones have been designed but it remains to be seen how far they are effective (Ref. 60).

Of these Kirsanov's (Ref. 61) method is provisionally used at the Macaulay Institute for phosphate and Dirks' for potash : the latter, however, is not entirely satisfactory.

The distinguished French chemist, A. Demolon, has summarized his experience as follows (Ref. 62) :—

Nitrogen. No examination is necessary, as 97 per cent. of all soils (more than 200) tested in field experiments responded to nitrogenous fertilizers.

Phosphoric acid. Using the citric acid test the following indications are obtained :—

Grams of P_2O_5 per 1000 grams of soil.	Response to phosphatic fertilizers.	No. of soils examined
Less than 0·12	Good : 20 per cent. or more crop increase obtained.	8
0·12–0·32	Moderate and variable ; according to fertilizer, crop and depth of soil.	16
More than 0·32	None.	13

Potash. Using the Schloesing–de 'Sigmond method the following indications were obtained :—

Grams of K_2O per 1000 grams of soil.			Response to potassic fertilizer.
Cereals.	Other crops.		
No farmyard manure	No farmyard manure	Farmyard manure	
Less than 0·12	0·15	0·10	Good : 30 per cent. or more.
0·12–0·25	0·15–0·40	0·10–0·30	Moderate and variable.
More than 0·25	0·40	0·30	None.

Numerous other tests have been devised in Germany where much valuable field material has been furnished by the Farmers' Field Experiment Societies, consisting of groups of farmers who undertake to carry out specified field experiments on their farms and in addition furnish sufficient money to pay the modest salary of a college-trained observer. Hitherto material of this kind has been lacking in England but field experiments organized from Rothamsted are now being made for the purpose of remedying this defect. With good field trials it will be possible to examine critically the various methods of soil testing already proposed and possibly even to suggest better ones.

METHODS OF FIELD EXPERIMENT.

For some years past investigations have been made at Rothamsted into methods of field experiment with the view of improving their accuracy and ensuring a valid estimate of the unavoidable errors. Experience shows that the Latin square gives more accurate results than the "block," but nevertheless the "block" has many advantages and its design has been steadily improved (Ref. 63). Methods have also been worked out (Ref. 64) for allowing for the loss of a plot, an accident that is always liable to happen in a complex experiment involving 80 or 100 plots or even more, as is not unusual in modern field work.

MANURING OF CROPS.

Sugar Beet. Sugar beet presents some of the most difficult problems in modern agriculture. The average yield in England at the present time is only 8·5 tons per acre: this is too low for a successful industry, and it appears to be unnecessarily low because many growers obtain 13 and 14 tons per acre, and there seems no reason why the average should not be raised to exceed 10 tons per acre. Mere variations in the proportions of the fertilizers afford no prospect of solving the problem: something more is needed which, however, has not been definitely determined. The straight effects of fertilizers on the crop are shown in the following table, which summarizes the results of all the Rothamsted centres during the seven years 1926–1932 (Ref. 65).

Nutrient.	Number of Experiments.	Number of Increases.	Significant Decreases.	Per cent. of Experiments.	
				Increases.	Decreases.
Nitrogen—					
Roots .	42	26	0	62	0
Tops .	37	27	0	73	0
Sugar %	30	1	17	3	57
Potash—					
Roots .	28	11	1	39	4
Tops .	26	5	0	19	0
Sugar %	24	5	0	21	0
Phosphate—					
Roots .	19	3	0	16	0
Tops .	17	1	0	6	0
Sugar %	16	0	0	0	0
Salt—					
Roots .	9	5	0	55	0
Tops .	6	3	0	50	0
Sugar %	9	2	0	22	0

The average response to the different fertilizers is shown as follows:—

	Per cwt. N (as sulphate of ammonia)	Per cwt. P_2O_5 (as super)	Per cwt. K_2O (as muriate)	Salt (per cwt.)
Roots (washed) tons per acre	+2·31	+0·46	+0·51	+0·59
Sugar percentage . .	—0·56	+0·12	+0·14	+0·22
Total Sugar cwt. per acre .	+ 6·9	+ 1·3	+ 2·0	+ 2·6

Perhaps the most unexpected result has been the marked effect of salt (sodium chloride) on the yield and sugar content of the beet. The reason for this has not yet been discovered.

The Jealott's Hill experiments confirm the Rothamsted result that nothing is gained by giving part of the nitrogen as top dressing and part with the seed. There did appear, however, to be a relation between the nitrogen and the potash, and as the dressing of nitro-chalk increased so the potash dressing had to increase also. The optimum mixture corresponded to $1N : 1P_2O_5 : 1\frac{1}{2}K_2O$ (Ref. 66), the nitrogen content being about 70 lb. per acre.

The great importance of lime on acid soils has been established: at Tunstall where the acidity is very pronounced the yield without lime was under 2 tons per acre; when chalk was added it rose to nearly 15 tons per acre. This is no doubt unusual, but in the experiment at Oaklands, St. Albans, a yield of 5¼ tons without lime or phosphate was raised to practically 9 tons by adding both these substances (Ref. 67). There is, however, something more involved, and experiments are now in hand on the lines of combined fertilizer, cultivation and variety trials to see if the main lines can be discovered on which a large improvement in yield can be based. All these experiments take a long time to carry out and one can only regret that some of the subsidy was not used from the outset for the purpose of studying these problems.

Potatoes. The Rothamsted experiments show that a mixture containing $1N : 1\frac{1}{2}P_2O_5 : 2\frac{1}{2}K_2O$ usually gives good crop increases, but wherever phosphate deficiency is known to exist more phosphate must be given. Remarkable responses to phosphate are obtained on the fen soils; on some of these even 10 cwt. superphosphate per acre was not too much.

Wheat. The new quota arrangements are causing farmers to take much more interest in wheat than they have done for some time past. The experiments at Rothamsted and elsewhere continued in spite of the depression and, although one might hardly have expected it, they have brought out some new results. Fuller examination of the Broadbalk data by the new statistical methods has shown that (Ref. 68) the relative merits of autumn and spring dressings of sulphate of ammonia depend not on the winter rainfall but on the rainfall of the following spring and summer. Autumn applications of sulphate of ammonia are as effective as spring applications, and indeed may be better, in years when spring and summer are warm and dry. This explains the Continental practice of autumn nitrogenous dressings both for cereals and for sugar beet; the Continental summers are commonly warmer and drier than ours. This question of time of application of fertilizers has come into prominence in Germany as indeed it well might, for there is obviously no point in buying manure for autumn application if they might equally well be purchased six months later and the corresponding bank overdraft charges saved. From certain preliminary comparisons so far made (Ref. 69) it appears that sulphate of ammonia and cyanamide are better applied in winter, as also are phosphates and potash, but that for nitrate of soda the spring application is at least as good. Field experiments, however, are not yet sufficiently accurate to answer with certainty questions of this sort where the differences are only small.

In the Jealott's Hill experiments (Ref. 70) the later the application of the nitrogenous fertilizer the less was the length and yield of straw and the greater the yield of grain provided the dressing is not given later than mid-May; after this, however, dressings of nitrogen may decrease the yield of grain in a dry season.

Experiments on the effect of the preceding ley, of fallowing and of bastard fallowing on the subsequent growth of wheat are being made at Rothamsted and have shown, among other interesting facts, a distinct reduction in winter killing of the wheat after a bastard fallow. The effect does not appear to be due to nitrate accumulated during the fallow (Ref. 71).

Composition and Quality of Wheat. Soil and climatic factors affect the composition of wheat just as they do that of barley. But while high quality in barley is usually associated with low nitrogen content, high quality in wheat is usually associated with high nitrogen content of the grain. High quality wheat and high quality barley, therefore, do not grow together. The wheat problem has been studied for many years by F. T. Shutt and his associates in Ottawa (Ref. 72) and the results of the protein surveys have recently been summarized by the Grain Commissioner of Winnipeg (Ref. 73). The important nitrogenous constituent is the gluten: this affects the quality of the grain partly by its character and partly by its amount. Its character is largely inherited and is therefore a matter of variety, but its quantity is largely determined by environmental conditions: chiefly water supply, but also temperature and hours of sunshine. Anything that decreases the soil moisture raises the amount of protein in the wheat. Newly broken prairie land contains more organic matter, and therefore more soil moisture, than adjoining land that has been long under cultivation: it yields wheat of lower protein content. Wheat grown on irrigated land contains less protein than that on adjacent dry land, while wheat grown in the moist maritime provinces contains less than that in the drier prairie regions.

Barley. The results of ten years' experiments under the Institute of Brewing research scheme have now been published (Ref. 74). The chief factors determining quality are the soil and the weather: with good cultivation manuring can notably improve the yield without detriment to quality. Of the varieties at present available, Plumage-Archer and Spratt-Archer have proved the best, giving about 5 to 10 per cent. more yield than most others: Plumage-Archer yields slightly less than Spratt-Archer but both its 1,000 corn weight and its average valuation are slightly better. Fallow proved the best preparation both for yield and quality; the sowing should be as early as possible consistent with the getting of a good tilth and the likelihood of steady continuous growth: once growth has started a check may do harm. When the sowing has been thrown late there is no known way of making up the loss in quality. Winter sowing sometimes gives even better results than early spring sowings: in Essex autumn sown Plumage-Archer has given a 50 per cent. better cash return than spring sown, but one cannot rely on this No two-rowed variety is entirely hardy enough for our winters.

The rate of seeding has not proved very important; 2½ bushels usually gives as good a result as any other. The drills should not be too wide; the usual 7 inches is quite wide enough, indeed in some of the Sprowston experiments 4 inches gave somewhat better yields and equally good quality. Widening of the rows much beyond the usual width raised the nitrogen content of the grain, which is undesirable.

The addition of suitable fertilizer raises the yield without injuring the quality; indeed in general it improves the valuation set on the grain by the buyer. Nitrogen is the most important constituent: 20 lb. per acre, corresponding to 1 cwt. sulphate of ammonia or 1¼ cwt. nitrate of soda, is usually a satisfactory quantity, giving some 5 or 6 additional bushels per acre. Superphosphate is also needed unless the soil has recently received substantial dressings, such as were commonly given to the root crop; potassic fertilizers are effective on light soils but not on others.

The most important weather conditions are: (1) late winter rainfall in so far as this determines the date of sowing and the state of the seed bed; (2) the rainfall during March and April, which lowers the yield if it much exceeds the usual quantity, though too much drought is also harmful; (3) rainfall during April, May and June, which, if above the usual, lowers the nitrogen content and so tends to improve the valuation, while drought during this period has the opposite effect, raising the nitrogen content and lowering the valuation. Temperatures above the normal in July lower the yield and slightly raise the nitrogen content. The effect of weather on the barley crop is gradually being worked out and it should before long be possible to make in June very fair forecasts of the yield and nitrogen content of the barley crop that will be reaped in the following August. However satisfactory the nitrogen content and the size of the grain, the suitability of the crop for malting will be finally determined by the weather conditions at harvest time. No pale ale brewer will buy weathered barley or malt made from it nor will the maltster buy barley of low germinating capacity. It is possible that drying processes may prove of great assistance in wet seasons but a good deal of experimental work still has to be done before they can be regarded as established practices.

Kale. Our experience with kale is very promising. The crop is hardy, easy to grow, convenient in use and much liked by stock; its leaves are rich in protein, and its yield is easily increased by nitrogenous manuring. On the light soil at Woburn we have been able to push the yields up to 28 tons per acre, and even higher yields may be possible; indeed, kale appears to be one of the most suitable crops for converting cheap fertilizers into animal food.

Thinning and cultivating beyond what is necessary for keeping down weeds were not only unnecessary, but reduced the yield about 2 tons per acre. The results were :—

	Unthinned.	Thinned.
Number of plants per acre, about	56,000	14,500
Yields, tons per acre:		
Ordinary cultivation	27·65	25·18
Intensive cultivation	25·51	23·63

Samples of the crop were taken each month from November to March: analysis showed that the content of nitrogen increased up to mid-January; there was no gain in dry matter after mid-November, but also there was no loss. After February both dry matter and nitrogen fell off as the result of the withering of some of the leaves.

The Jealott's Hill fertilizer results (Ref. 75) agree with those obtained at Rothamsted: from 6 to 9 cwt. of nitro-chalk could profitably be used per acre and the best yields obtained were, in tons per acre :—

1929	1930	1931	1932
22	18·15	24·8	27·8

Wider spacing than normal decreased the yield.

Grass. Much work has been done in recent years on the possibility of improving grassland.

1. *Laying down to grass.* At Aberystwyth experiments continue on the strains and varieties of grasses and clovers. At Rothamsted various mixtures are sown down and observations

are made on the effects of manuring and grazing in maintaining or modifying the original composition. It is found that management profoundly alters the herbage, and so long as the proper plants are sown, their exact proportions in the mixture do not much matter, as the herbage type soon becomes established.

2. *Effect of manuring in increasing the yield and modifying the composition of the herbage.* The classical Rothamsted experiments show that manuring besides affecting the yield also changes the herbage in two ways: it increases the proportion of nitrogen or mineral matter in the herbage, and it alters the proportion of the different species of plants by encouraging some more than others and therefore enabling them to crowd out their less fortunate neighbours. The Jealott's Hill (Ref. 76) experiments show that nitrogenous manuring of pastures grazed rotationally brings about increases in total yield of grass and of crude protein, and also smooths out the curve of productivity, increasing the yield at the beginning and end of the season and also at critical periods such as midsummer drought. The effect on the early growth, however, depends on the soil temperature: if this remains between 40°F. to 50°F. at 4 inches depth for some time the effect may be considerable: it is, however, only small if the temperature quickly rises above 50°F.

These general results are obtained in all parts of the world wherever the experiment has been tried and a vast amount of experimental work on pasture improvement is now being done. It is unnecessary here to go into details of work in the various countries: the general methods are those stated above and the general results also are the same (Ref. 77).

3. *General management.* R. G. Stapledon has brought together in a series of four addresses a summary of his investigations extending now over many years. He shows that the composition of the herbage depends on the extent to which the different species are defoliated. Timothy and Italian rye grass are the most palatable of the grasses: then follows in order white clover, perennial rye grass, cocksfoot, meadow fescue, meadow foxtail, Yorkshire fog, bent, fine-leaved fescues. All, however, are improved in palatability if kept sufficiently well grazed.

Excessive overgrazing tends to eliminate these—one rarely finds timothy in a well grazed pasture—and weeds then take their place. Undergrazing in early summer, however, also leads to weediness, because the formation and shedding of seed is not interfered with.

The palatability is very much a matter of leafiness. The leaves of rye grass grow fast and for a long time, hence their high palatability. Bent and fine fescue leaves grow so slowly that they never become palatable. Cocksfoot grows very rapidly and during growth is very palatable, but after growth ceases it becomes unpalatable.

On hill pastures the first stage in improvement is to improve the soil conditions and this can be done economically only when the conditions are sufficiently open to improvement: on southern slopes that can be fenced off from the surrounding pasture; and when the herbage is predominantly either *Nardus* (mat grass), *Molinia* (flying bent) or bent-fescue. The procedure is first to burn the wild vegetation, then to tear up the surface and dress with manure (5 cwt. basic slag and 1 cwt. nitro-chalk per acre) and finally a simple and inexpensive seed mixture is sown, including wild white clover. Inoculation is advantageous and may indeed be necessary. Thanks to a generous benefaction by Sir Julian Cahn, Professor Stapledon has been able to start reclaiming considerable areas by this method.

The effect of grazing and resting in modifying the composition of the herbage has been studied by Martin G. Jones at Jealott's Hill in one of the most interesting grassland investigations made in recent years. This work (Ref. 78) followed on from some of the Aberystwyth investigations. Resting during winter and spring was found to be essential for preserving rye grass owing to the circumstance that this is one of the earliest grasses to start into growth in spring. This is the management adopted on the good feeding portions of the Midlands and it accounts for the large proportion of rye grass they contain.

On the other hand rough-stalked meadow grass suffered through the winter and early spring rest, not because it was itself benefited by winter grazing, but because the good growth of rye grass kept it in check. Grazing before May thus injured rye grass more than it injured rough-stalked meadow grass. Wild white clover did not benefit from the winter rest, indeed it was improved by close grazing in early spring. The weeds also were improved by grazing, and the best way of keeping down the creeping thistle was to allow the perennial rye grass to develop. Cocksfoot was encouraged by grazing hard in early spring when the rye grass was damaged (this being slightly earlier in growth than cocksfoot), grazing lightly in late spring and early summer, and resting in August and early September.

Thus a pasture can be made clover-dominant by close grazing in spring, grass-dominant by winter and spring rest, when the grasses grow up and check the clover, and weed-dominant (Yorkshire fog, bent, thistles) by over-grazing in winter and spring and under-grazing in summer and autumn—

a common method of management. This result is independent of the manuring, which, however, raises the yield of whatever type of herbage is being produced. The Romney Marsh fatting sward was reproduced by light winter stocking and very heavy summer stocking ; the Midland fatting swards by rest in winter, very light grazing in spring and moderate grazing in summer when the grass has grown well ; and an ordinary weedy sward by heavy stocking with sheep in winter and early spring. Well controlled rotational close-grazing reduced weeds considerably.

DEFICIENCY DISEASES—" BUSH SICKNESS " IN NEW ZEALAND.

Reference was made last year to the " Bush sickness " caused in New Zealand by deficiency of iron in the herbage and curable by dosing with iron salts or giving limonite licks. An interesting development of this work has been the observation by T. Rigg and his associates (Ref. 79), that sheep normally obtain iron direct from the soil. The paunch contents of animals fed on healthy pasture showed that they had eaten a quantity of soil equal to about 0·4 per cent. of the green weight of the herbage eaten, and this soil supplied four times as much iron as an unhealthy pasture even where the herbage of both healthy and unhealthy pastures contained the same amount of iron. Dr. Rigg recalls an observation by Hogg, the Ettrick shepherd, that in the Cheviots the pining of sheep—apparently the same thing as bush sickness—was unknown when the country was over-run with moles, and appeared only after they had been exterminated.

SMOKE DAMAGE TO CROPS AND STOCK.

Smoke damage to crops and stock often causes considerable trouble to farmers and forms the subject of disagreeable negotiations with the factory proprietors. An investigation was made in Germany of the quantities of four harmful substances, arsenic, lead, zinc and copper, in the soils surrounding an isolated smelting works which had been in operation for some 400 years. The soils near the works contained a good deal of these substances : an area of 15 square kilometres (about 3,700 acres) round the works contained in the top 5 inches (20 cm.) of soil, which weighed about 3·6 million tons, no less than 600 tons of arsenic, 800 tons of lead, 900 of zinc and 200 of copper. There was, however, no evidence that these quantities were harmful to vegetation except perhaps the highest concentration of arsenic. In the zone 2 to 3 kilometres (2,200 to 3,300 yards) distant from the works the quantities were much less, and outside this still less (Ref. 80). An enquiry in England, however, showed that certain pasture near to coke ovens contained a good deal of lead and copper in the herbage, with sufficient lead to injure and even kill sheep and cattle (Ref. 81).

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NOTE.

For the past eight years, the Royal Agricultural Society of England has issued annual summaries of Agricultural Research as carried on in its leading branches, prepared under the direction of the Research Committee of the Society. The publication, originally issued under the title of *Agricultural Research,* is now known as *The Farmer's Guide to Agricultural Research,* for this describes the main purpose with which the Society undertook the work, namely to spread the lessons of research amongst those to whom they are likely to be of greatest use by giving the farmer information on the results of the year's work at the experimental stations in a summarized and simple form.

The survey of scientific work which it provides is not limited to research conducted in the British Isles, but includes references to the results achieved in any part of the world from which light may be thrown upon the problems of British agriculture.

In previous years, the publication has been issued in book form, free to members of the Society on application to the Secretary and available at a nominal charge to the general public. In the current year and for the future the Council has decided to extend its usefulness by making *The Farmer's Guide to Agricultural Research* a section of its *Journal,* so that it may be in the hands of every member of the Society. At the same time, a limited number of copies will be bound separately, as before, for distribution to the Press and to agricultural Education and Research centres.

In this year's issue, the section on Farm Crops which was omitted last year has been reintroduced, under the authorship of Dr. G. D. H. Bell, of the School of Agriculture, Cambridge, and Mr. C. S. Orwin is again contributing the section on Farm Economics. Mr. Orwin, who rendered invaluable service in organizing the compilation and character of the volume and who has been responsible under the Research Committee for the editorial work since its production in 1925, is resigning on the completion of this issue. He will be succeeded by Professor J. A. Scott Watson, the Editor of the *Journal.*

A few copies of previous issues, those for the years 1925–1931, are still available.

CONTEMPORARY AGRICULTURAL LAW.

I.—LEGISLATION.

THE legislation passed in the present Session of Parliament (with the exception of the Agricultural Marketing Act, 1933, which is dealt with in a separate article in this number of the Journal) does not greatly affect agricultural interests.

The Children and Young Persons Act, 1933 (23 Geo. 5, c. 12) should, however, be noticed so far as it deals with the employment of children and young persons in agriculture. So long as the child is under 12 years of age, he may not, under Section 18, be employed more than two hours on any day on which he is required to attend school, but bye-laws may be made by the local authority authorising the employment of children under 12 years of age by their parents and guardians in light agricultural or horticultural work. By Section 19, a local authority may make bye-laws with respect to the employment of young persons under the age of 18 years, other than children—a child being defined as a person under the age of 14 years—prescribing (*inter alia*) the number of hours in each day, the times of day at which they may be employed and the intervals to be allowed for meals and rest, but it is expressly provided that nothing in this Section shall empower a local authority to make bye-laws with respect to employment in agriculture.

The Protection of Animals (Cruelty to Dogs) Act, 1933 (23 and 24, Geo. 5, c. 17) enables Courts to disqualify persons convicted of cruelty to dogs, from keeping a dog and from holding or obtaining a dog licence for such period as the Court thinks fit.

The Finance Act, 1933 (23 and 24, Geo. 5, c. 19) besides reducing the excise duties on beer, by Section 2 continues the duties of customs charged by Section 7 of the Finance Act, 1925, as amended by Section 4 of the Finance Act, 1929, on hops, hop oils and preparations made from hops, until August 15th, 1937; Section 30 continues the allowance for repairs to buildings until April 5th, 1936.

The Rent and Mortgage Interest Restrictions (Amendment) Act (23 and 24, Geo. 5, c. 32) applies the Rent Restrictions Acts to dwelling houses where the annual amount of recoverable rent or the rateable value did not exceed, in London £45, and elsewhere in England £35. Houses of a higher rental or rateable value are decontrolled. The First Schedule to the Act enables a landlord to obtain possession of a dwelling house, to which the Rent Restrictions Acts apply, without proof of suitable alternative accommodation (when the Court considers it reasonable so to do) if he reasonably requires it as a residence for some person (1) engaged in his whole-time employment, or (2) in the whole-time employment of some tenant from him, or (3) with whom, conditional on housing accommodation being provided, a contract for such employment has been entered into, and either (1) the tenant was in the employment of the landlord or a former landlord, and the house was let to him in consequence of that employment, and he ceased to be in that employment, or (2) the Court is satisfied by a certificate of the County agricultural committee or, when there is no such committee, of the Minister of Agriculture and Fisheries, that the person for whose occupation the house is required by the landlord is, or is to be, necessarily employed for the proper working of an agricultural holding, or as an estate workman on the maintenance and repair of the buildings, plant, or equipment of agricultural holdings comprised in the estate.

The Slaughter of Animals Act, 1933 (23 and 24, Geo. 5, c. 39) by Section 1 forbids the slaughter in a slaughter house or knacker's yard, except it be instantaneously slaughtered or by stunning be instantaneously rendered insensible to pain until death supervenes, of any animal to which the Section relates; but the provisions of the Act are not to apply to the slaughter of any pig, boar, hog or sow in a slaughter house or knacker's yard in which a supply of electric energy is not available; or to any animal slaughtered without the infliction of unnecessary suffering by the Jewish method for the food of Jews or by Mohammedan method for the food of Mohammedans. Section 2 gives local authorities the power to pass resolutions applying Section 1 to sheep, ewes, wethers, rams and lambs; but in any area in which no such resolution is in force those animals will be exempt from Section 1. By Section 3 no animal may be slaughtered or stunned in a slaughter house or knacker's yard by any person without a licence granted by a local authority. By Section 9 " animal " means any horse, mare, gelding, pony, colt, filly, stallion, ass, donkey, mule, bull, cow, bullock, heifer, calf, steer, ox, sheep, ewe, wether, ram, lamb, pig, boar, hog, sow, goat or kid. The Act comes into operation on January 1st, 1934.

II.—CASES IN THE COURTS.

1. *Labour. Keane* v. *Mount Vernon Colliery Co.* (1933, A.C. 309; 102.L.J.P.C. 97) is an important case in respect of the question who may be treated as partial dependants of a deceased workman who has been killed in the course of his employment. The deceased workman, a miner, was, at the time of his death, living with his father, his mother and his two sisters in family together. The total receipts of the family

were £6 9*s.* 3*d.* weekly, including the earnings of the other members of the family. This whole sum was each week handed over to the mother and she paid the rent, defrayed household expenses and provided herself and the other members of the family with clothes and pocket money, saving nothing. By the death of the deceased the family income was reduced to £3 6*s.* 11*d.* The arbitrator awarded the mother, as partially dependent, £100 compensation, but he held that the other members of the family were not to any extent dependent on the deceased for the provision of the ordinary necessaries of life suitable for persons in their class and position, notwithstanding that the mother had given evidence that, in consequence of the reduction in income, she was not able to buy the same quality of food and that her daughters could not go to so many dances and picture houses, and did not get so many clothes. The arbitrator found that, for a family of four or five adult persons in the class and position of the claimants, the sum of 17*s.* a week per person (or a total of £4 5*s.* in the case of a family of four) was sufficient for the provision of the suitable necessaries of life. His decision was affirmed by the Court of Session in Scotland and again affirmed by the House of Lords, on the grounds that (1) in awarding £100 to the mother he was dealing with a question of fact and had not proceeded on any footing wrong in law; (2) that, though the average wage in industry did not necessarily enter into the problem of ascertaining the standard of life of a family, the arbitrator was not shown to have disregarded the question of the standard of family life; his conclusion was one which it could not be said there was no evidence for, nor was it reached by considerations not permitted by law; (3) that the arbitrator was entitled to use, and ought to have used, his own knowledge of local conditions.

2. *Landlord and Tenant.*—The decision in *Farrow* v. *Orttewell* (1933, 1 Ch. 489; 102 L.J. Ch. 133) which was noted in this Journal last year (p. 241) was appealed, but the appeal was dismissed. It was a case where a purchaser had entered into a contract to purchase freehold land and, before he had completed the purchase, gave to the tenant of an agricultural holding on the land, a notice to quit, which the tenant believed at the time when the notice was given, and until shortly before it expired, to be a good and valid notice to quit. The tenant in consequence took another farm, sold his stock and quitted his holding. Shortly after the notice had been given the purchaser had obtained a conveyance of the land. It was held by the Court of Appeal, affirming the decision of Mr. Justice Bennett, that although the purchaser, not being at the time the landlord, had no legal power to determine the tenancy at the date when the notice to quit was given, he was nevertheless

estopped by his conduct from denying its validity; the tenant was, therefore, entitled to compensation under the Agricultural Holdings Act, 1923. The Court of Appeal also held that the provision, in Section 16 of the Act of 1923, of a system of arbitration had not ousted the jurisdiction of the Court to determine the question of the validity and effect of the notice to quit.

Saunders-Jacobs v. *Yates* (1933, 2 K.B. 340; 102 L.J.K.B. 417) is another case in which the Court of Appeal confirmed the decision of Mr. Justice Macnaghten in the Court below, which was noted in the Journal of last year (p. 241). Land was let by a lease containing a covenant not to occupy, use or employ it for any trade except that of a nurseryman, market gardener, florist or farmer, without the written consent of the lessor, and it was held that the land was in fact let for the purpose of a market garden within Section 48, Subsection 1 of the Agricultural Holdings Act, 1923, although there was no covenant by the lessee that he would cultivate the land as a market garden. The lessee in fact cultivated the land as a market garden and it was held that, excluding a house and garden which he had sub-let, it constituted a "market garden" within the Act and he was, therefore, entitled to compensation on that basis.

In *Grundy* v. *Hewson* (1933, 1 K.B. 787; 102 L.J.K.B. 398), on January 16th, 1929, the tenant of an agricultural holding gave notice in writing to the landlord demanding, in accordance with Section 12, Subsection 3, of the Agricultural Holdings Act, 1923, arbitration on the question of the rent to be paid for the holding, as from April 6th, 1930, the next date on which the tenancy could have been terminated by notice given by the tenant at the date of the demand. The landlord agreed to the matter being referred to arbitration but protracted delays took place owing to the attitude taken up by the landlord and his advisers with regard to the appointment of an arbitrator. On April 7th, 1931, the tenant applied, under Schedule 2 of the Act, to the Minister of Agriculture and Fisheries to appoint an arbitrator. The landlord intimated that he would take no part in the arbitration proceedings and would decline to recognise the award. On September 23rd, 1931, the arbitrator made an award fixing a reduced rent as from April 6th, 1930. It was held, contrary to the decision of a County Court Judge, that the award was enforceable and binding between landlord and tenant.

3. *Tithe Rent Charge.*—In *Warden and Scholars of New College, Oxford* v. *Davison* (49 Times L.R., 579) it was held that where, under Section 81 of the Tithe Act, 1836, and Section 2 of the Tithe Act, 1891, the bailiff of a County Court levies a

distress for unpaid tithe, he must give the tenant ten days' notice.

In *Queen Anne's Bounty* v. *Thorne* (1933, W.N. 229) the Court decided that, under those Acts, household furniture of the tenant could be distrained upon.

4. *Rates and Taxes.—Munroe & Cobley* v. *Bailey* was a case in which the tenant used the land for bulb-growing, but also cultivated ordinary crops thereon in rotation. The Income Tax Commissioners assessed the farms to income tax under Rule 9 of Schedule B, which provides that profits from land occupied as gardens for the sale of produce should be estimated according to the provisions of Schedule D, but should be assessed and charged under Schedule B as profits arising from the occupation of land. The appellants claimed that their land was occupied for purposes of husbandry and not as gardens for the sale of produce and that accordingly the land should be taxed under the first paragraph of Schedule B in respect of the occupation, for every 20*s*. of the assessable value. The House of Lords, affirming the decision of the Court of Appeal noted in this Journal for last year (p. 242), held that the matter was a question of degree and there was no general principle to govern such a case and it was a question of fact for the Commissioners, who were familiar with the system of farming, husbandry and gardening and who had evidence upon which they could arrive at their conclusion. The land was, therefore, not assessable as a market garden and the profits should be assessed under Schedule D.

On the other hand in *Glanely* (*Lord*) v. *Wightman* (102 L.J.K.B. 456) the House of Lords reversed the decision of the Court of Appeal (noted on p. 242 of this Journal for last year) that in the case of a stud farm the profits from stallions' fees should be separately assessed to income tax under Schedule D of the Income Tax Act. They held that the occupation of the land was in itself the source of the income and of the profits to be taxed, which should not be separately assessed. The breeding and sale of foals arose from such occupation and, therefore, the payments for services of stallions for use upon the land, or of mares sent to the land, was a normal part of the purposes for which the land was occupied and inseparable therefrom and included in Schedule B.

Cleobury Mortimer Rural Council v. *Childe* (1933, 2 K.B. 368 ; 102 L.J.K.B. 580) was a rating case where land was let by the owner under a written agreement not under seal whereby the owner reserved to himself the right of sporting over the land. When assessed for a general rate in respect of these rights, he refused to pay the rate and on application being made for a distress warrant, the Justice refused to issue distress. It was held, in a case stated to the King's Bench Division, that sporting rights severed from the occupation of agricultural land, but not let, constitute a rateable hereditament and are not entitled to the exemption from rates granted to agricultural land by the Local Government Act, 1929, Section 67. The authority for rating such sporting rights is contained in the Rating Act, 1874, Section 3 and 6, Subsection 3. It was held also that although an incorporeal hereditament of sporting rights can only be granted by deed under seal, the letting of the land by an agreement not under seal, which reserves the right of sporting to the owner, is a severance within the meaning of the Rating Act, 1874, and the owner of such severed sporting rights is liable to be rated under the Rating Act, 1874, Section 6, Subsections 3 and 4.

In a Scottish case of *Lanarkshire Assessor* v. *Smith* (1933, S.C. 366) a dwelling house was erected by the Department of Agriculture on a Poultry Farm for a smallholder, and it was held that poultry farming was agricultural and that the dwelling house fell within the exemption and should not enter the Valuation Roll.

5. *Produce.*—In *Walley* v. *United Dairies* (*Wholesale*), *Ltd.* (77 Sol. J. 251) the plaintiff, a farmer of Eaton, Tarporley, Cheshire, claimed from the defendants an account under a contract dated September 22nd, 1930, by which the plaintiff agreed to sell, at certain varying seasonal prices, to the defendant company, from October 1st, 1930, to September 30th, 1931, the whole of the milk produced by his cows. Under the contract the milk was to be delivered at the defendant's depot at Calveley, Cheshire, which was the nearest railway station. The contract also provided that the price per gallon to be paid by the defendants to the plaintiff should be a specified sum per month, less a sum equal to the railway carriage of the milk to London, and one halfpenny per gallon. The extra halfpenny was in respect of handling and cleaning charges at the depot. In consideration of the despatch of milk from the plaintiff's and other farms in the district, from Calveley to London, in large quantities, the defendants were allowed a rebate by the railway company of 30 per cent. of the rate-book charge. The plaintiff contended that the defendants could deduct from the specified price not more than the railway charges actually paid by them in respect of the railway carriage of the milk. The defendants contended that they were entitled to deduct the charge per gallon appearing in the current railway rate-book irrespective of whether the milk was conveyed to London or elsewhere by rail, or at all, and irrespective of the rebate of 30 per cent. on milk sent in large quantities. Mr. Justice Macnaghten held that the defending company was

not entitled to deduct from the monthly price a sum in excess of the amount actually paid by them for the railway carriage to London, and gave judgment for the plaintiff with costs. It was said that the decision affected a large number of farmers throughout the country.

6. *Miscellaneous.—Seaton* v. *Slama* (31 L.G.R. 47; 77 Sol. J. 11) is an instructive case on rights of way. In 1928 the plaintiff purchased a large strip of foreshore and let part of it for caravans and bungalows. He erected a fence round the land side with gates at three places at which parties other than local inhabitants were charged 1*d.* toll. The defendant, the proprietor of a tea-shop at the western end of the plaintiff's land, claimed that the fence obstructed five public or customary rights of way. Four of the alleged public ways were over land flooded at spring tides. For the purpose of asserting these rights the defendant pulled down some of the plaintiff's fence and did not absolve himself from association with a mob which pulled down another part of the fence. The defendant, without joining the Attorney General, counter claimed for a declaration that the five ways were public ways, alleging that his tea-shop gave him an interest in their remaining open, which was not possessed by the general public and that, therefore, the fiat of the Attorney General was not necessary. It was held (1) that there was a public right of way over three of the ways; (2) that the damage done by the defendant was excessive; (3) that the fiat of the Attorney General was necessary. His Lordship said that in no view of the case was the defendant entitled to break down the fence. If the gate were locked he would only be justified in removing the lock.

AUBREY J. SPENCER.

Lincoln's Inn.

AGRICULTURAL STATISTICS.

THE decision to publish the Journal at an earlier date than has been customary has prevented the preparation of the usual review of Agricultural Statistics. The following pages give, however, a summary of the acreages of crops and grass and numbers of livestock returned by occupiers on June 3rd, 1933, together with the corresponding figures for 1932.

Under crops, noteworthy increases occurred in the areas devoted to wheat (29 per cent.), sugar beet (43 per cent.), and several of the vegetable crops such as cabbage, Brussels sprouts and cauliflowers. Increases of a small order were also recorded in potatoes, fruit and hops.

Acreage Under Crops and Grass *and* **Numbers of Live Stock** *on holdings above one acre in extent in England and Wales as returned by occupiers on the 3rd June,* 1933, *and 4th June,* 1932.

(The figures for 1933 are subject to revision).

Distribution.	1933.[2]	1932.	Increase (+) or Decrease (-).
	Acres.	Acres.	Acres.
Total Acreage under all Crops and Grass	25,112,000	25,206,000	- 94,000
Rough Grazings[1]	5,396,000	5,357,000	+ 39,000
Arable Land	9,246,000	9,367,000	- 121,000
Permanent Grass for Hay	4,602,000	4,542,000	+ 60,000
,, ,, not for Hay	11,264,000	11,297,000	- 33,000
Wheat	1,660,000	1,288,000	+ 372,000
Barley	751,000	961,000	- 210,000
Oats	1,494,000	1,580,000	- 86,000
Mixed Corn	104,800	114,400	- 9,600
Rye	19,900	24,600	- 4,700
Beans, harvested as corn	139,600	138,600	+ 1,000
Beans, picked or cut green	13,700	15,000	- 1,300
Peas, harvested as corn	72,800	65,800	+ 7,000
Peas, picked or cut green	63,500	60,500	+ 3,000
Potatoes	518,300	504,300	+ 14,000
Turnips and Swedes	555,300	580,500	- 25,200
Mangold	238,000	229,700	+ 8,300
Sugar Beet	363,900	255,000	+ 108,900
Cabbage for Fodder, Kohl Rabi and Rape	117,400	109,400	+ 8,000
Vetches or Tares	53,300	48,600	+ 4,700
Lucerne	33,600	39,400	- 5,800
Mustard for Seed	16,300	20,000	- 3,700
Cabbage for human consumption	33,100	33,900	- 800
Brussels Sprouts	35,900	33,000	+ 2,900
Cauliflower or Broccoli	20,700	17,700	+ 3,000
Carrots	14,100	12,500	+ 1,600
Onions	2,000	1,900	+ 100
Celery	7,300	7,700	- 400
Rhubarb	8,300	8,300	-
Linseed	1,100	1,300	- 200
Hops	16,900	16,500	+ 400
Small Fruit	59,800	59,500	+ 300
Orchards	249,400	247,300	+ 2,100
Clover and Rotation Grasses for Hay	1,261,000	1,538,000	- 277,000
Clover and Rotation Grasses not for Hay	813,000	873,000	- 60,000
Bare Fallow	457,000	434,000	+ 23,000
	No.	No.	No.
Horses used for Agricultural purposes (including Mares for Breeding)	645,400	655,100	- 9,700
Unbroken Horses (including Stallions) One year and above	84,900	83,600	+ 1,300
Unbroken Horses (including Stallions) Under one year	41,200	39,100	+ 2,100
Other Horses	130,800	139,300	- 8,500
TOTAL OF HORSES	902,300	917,100	- 14,800

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[1] Mountain, Heath, Moor, Down and other rough land used for grazing.

[2] Subject to revision.

Description.	1933.[1]	1932.	Increase (+) or Decrease (–).
	Acres.	Acres.	Acres.
Cows and Heifers in Milk	2,179,600	2,116,600	+ 63,000
Cows in Calf but not in Milk	358,000	352,000	+ 6,000
Heifers in Calf	418,000	402,800	+ 15,200
Other Cattle Two years old and above	997,400	938,900	+ 58,500
One year and under two	1,356,800	1,241,800	+ 115,000
Under one year	1,312,000	1,305,900	+ 6,100
TOTAL OF CATTLE	6,621,800	6,358,000	+ 263,800
Ewes kept for breeding	7,763,300	7,634,300	+ 129,000
Other Sheep One year and above	2,435,700	2,953,400	– 517,700
Under one year	7,886,300	7,907,700	– 21,400
TOTAL OF SHEEP	18,085,300	18,495,400	– 410,100
Sows kept for Breeding	404,600	425,200	– 20,600
Other Pigs	2,659,800	2,759,400	– 99,600
TOTAL OF PIGS	3,064,400	3,184,600	– 120,200

[1] Subject to revision.

On the other hand there were marked decreases in the acreages of barley (22 per cent.) of oats (5 per cent.), of turnips and swedes (4 per cent.), and of clover and rotation grasses for hay (18 per cent.).

Horses in use again showed a decline, but there was an increase of approximately 5 per cent. in the number of foals born.

All classes of cattle increased in numbers and the total national herd rose by over a quarter of a million head, or more than 4 per cent.

The ewe flock again showed a small increase (less than 2 per cent.), but there was a very striking decrease (17 per cent.) in the number of yearling sheep. The total flock consequently diminished by more than 2 per cent.

Somewhat smaller figures were recorded both for breeding sows and for other pigs.

THE R.A.S.E. AND ARGENTINA.

FROM time to time the Royal Agricultural Society has occupied itself in directions outside its general routine in the effort to give wider fulfilment to its duty—the stimulation and encouragement of agriculture. Its work in undertaking the management of the London Quarantine Station, its organization of Tractor Trials, its Agricultural Relief of Allies Fund and its War Emergency Committee may be quoted as a few of its more recent achievements in this larger field. During 1933 the

Society made another such gesture designed to strengthen the existing bonds between the agriculturists of this country and those of South America, who for many years have provided an attractive outlet for the produce of our stock breeders.

The presence in this country in March of an Argentine commercial Mission to Great Britain was regarded by the Council as offering an opportunity to bring together representatives of the two countries. Accordingly the Council of the Society gave a luncheon in London to Dr. John Roca and his associates, at which the historic friendship between Great Britain and Argentina was celebrated in cordial fashion.

The fact that no country in the world has done more than Argentina to popularize British breeds of livestock was emphasized by Mr. Adeane, who presided in the absence, through indisposition, of the President of the Society, the Duke of Devonshire. No country had paid more generously for our pedigree stock. For many years the Royal Agricultural Society had been in touch with the Rural Society of Argentina and still had the honour of nominating judges at the great Palermo Show. Dr. Roca spoke with great appreciation of the thought which had prompted the hospitality of the Royal Agricultural Society, whose Show, he said, was regarded by Argentina and all stock-breeding countries as the high court of scientific knowledge and practical experience of pedigree breeding. The aims of breeders in both countries were the same, and they were both agreed that it was essential to maintain the high quality of their livestock. Argentine breeders found it constantly necessary to renew the blood of their herds and flocks, and did so by purchasing animals in the only country that could produce those of the highest quality—Great Britain.

The luncheon, and the informal interchange of views which followed, were regarded both by the visitors and their hosts as having cultivated a spirit of sympathy between the agriculturists of the two countries.

COLONEL E. VINCENT V. WHEELER.

By the death of Colonel Wheeler, on the 21st May, 1933, the Council lost a most active and greatly valued member. Elected to the Council in 1889, Col. Wheeler at once entered wholeheartedly into the work of the various committees to which he was appointed, more especially the Botanical and Zoological Committee of which, in 1902, he became Chairman. He had a special interest in hop- and fruit-growing and took a leading part in organizing the Orchards and Fruit Plantations Competitions inaugurated by the Society.

At the Birmingham meeting of 1898 he acted as Steward of Produce; from 1899 until 1901 he was Steward of Dairying; and, from 1903 until 1905, Steward of Finance. He also served on the Finance, Journal and Education, Veterinary, Stock Prizes, Implement, Dairy and Produce, and Selection and General Purposes Committees of the Council.

Colonel Wheeler was very regular in his attendances at Council and Committee meetings, where his clear mind and wide practical knowledge were of great service. He was of quiet demeanour but precise in argument and his mind was a fertile source of ideas for the betterment of agriculture in general and the carrying out of the Society's objects in particular.

On the death of his father Colonel Wheeler succeeded to the estates of Kynewood and Newnham and farmed on his own account the home farm at Newnham Court. He was not only a competent farmer but an excellent landlord who took a close personal interest in his property and his tenants. He was ever willing to do his own part in the matter of repairs and improvements and expected his tenants to do their best by the land.

The land of the Teme Valley, in which the properties lie, is of first class quality for fruit and hop culture, and on the cultivation of these crops Colonel Wheeler was a recognized authority. He was a successful exhibitor of fruit and hops at various shows. Shortly before his death the home farm was given up and let to one of his tenants.

Colonel Wheeler was looked upon as the mainstay of agriculture in the Tenbury district, and also of the Ludlow Hunt. He was Chairman of the Hunt Committee for a number of years and rode to hounds boldly on a good horse. He was for many years Vice-Chairman of the Worcestershire County Council, and ultimately succeeded the late Mr. Willis Bund, O.B.E., as Chairman. He resigned this office on his unfortunate breakdown in health, but even after this he maintained his interest in the various committees. During the war years he had the onerous duties of the Chairmanship of the Agricultural Committee. He was also Chairman of the Tenbury Bench of Magistrates. As a young man Colonel Wheeler was called to the Bar at Lincoln's Inn in 1882.

It is worthy of note that Colonel Wheeler at the time of his death, was, in years of service, the oldest ordinary member of the Council.

Colonel Wheeler is survived by his wife, the daughter of the late Sir William Smith, of Eardiston, and by his one daughter, Mrs. Batley. He lived always at Newnham Court, and the esteem and regard in which he was held by his neighbours were shown by the presence of the great gathering at his funeral in Lindridge Parish Church.

Colonel Wheeler is succeeded as Worcestershire's representative on the Council of this Society by Mr. John Walker, of Knightwick Manor, Worcestershire, to whose father, Mr. Lawson Walker, of Broadwas-on-Teme, I am indebted for help in writing this appreciation.

In conclusion it may rightly be said that Colonel Wheeler was a man who, as farmer, landlord and country gentleman, most ably and wholeheartedly served his generation.

THOS. McROW.

THE DERBY SHOW, 1933.

THE Exhibition which took place at Osmaston Park from Tuesday, the 4th July, until Saturday, the 8th July, was the 92nd annual event of its kind organized by the Royal Agricultural Society of England, and Derby has now had the Royal Show no less than five times. Only one other city in the country equals this record, that is Newcastle-on-Tyne, and no other town or city has exceeded it.

In the Table below some particulars regarding the five Shows held at Derby are given for the purpose of comparison :—

Year.	President of the Year.	No. of Implement, etc., Stands.	Live Stock Entries.	No. of Persons Paying for Admission.	Financial Result, + =Profit. —=Loss.
1843	4th Earl of Hardwicke	113	730	No Record	—£3,164
1881	Mr. Wm. Wells	377	1,229	127,996	+£4,528
1906	Mr. F. S. W. Cornwallis	424	2,319	119,143	+£2,028
1921	Mr. R. M. Greaves	508	3,613	125,828	+£9,621
1933	Duke of Devonshire, K.G.	349	3,099	96,350	+£1,394

In view of the visit of the Royal Show to Derby, the Derbyshire Agricultural and Horticultural Society arranged to suspend their county show for the year, as they had done in 1906 and 1921, and their Members were granted special facilities and privileges in connection with the visit of the national show.

I think it can be said that all the conditions prior to the opening of the Show were favourable this year; although perhaps the country had not emerged from the general depression in

Photo by] [G. H. Parsons.

FIG. 1.—PERCHERON STALLION, "STOURHEAD LAGOR".
Winner of Champion Prize for best Percheron Stallion, Derby, 1933.
Exhibited by SIR HENRY H. A. HOARE, BART.

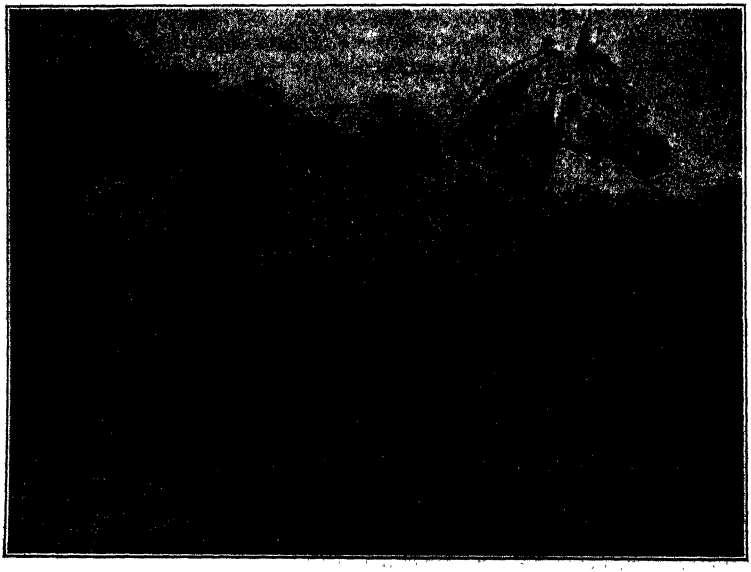


FIG 2.—PERCHERON MARE, "HISTON BEAUTY 4TH",
Winner of Champion Prize for best Percheron Mare or Filly, Derby, 1933.
Exhibited by MESSRS. CHIVERS & SONS, LTD.

agriculture and industry, there were no ominous clouds hanging over us such as there were in 1921, when there was a stoppage of work in the coal mines and serious outbreaks of Foot and Mouth disease throughout the country.

The wonderful weather in the early part of the year must have encouraged many exhibitors in all sections of the Show to send in their entries. Although such entries were larger than for the past two years, no difficulty was experienced in accommodating these in the showyard, or in their safe transport to the Show. The London Midland and Scottish Railway Company again utilized the special sidings and dock adjoining the site of the showyard, which had been reconditioned for the occasion.

It is, however, a matter for observation that, whilst at previous shows held at Derby most of the exhibits were conveyed to the Show by rail, this year a very large proportion, not only of the livestock, but of the implements and machinery, travelled by road vehicles, and special accommodation in the showyard was provided for the parking of these vehicles during the period of the Show, so that they might be readily available for the return journey.

The site of the showyard, a little over a mile from the centre of Derby, was exactly the same as that utilized for the shows of 1881, 1906, and 1921; although, as part of the land was in the occupation of the National Playing Fields Association, a somewhat different lay-out had to be arranged for this year's Show.

The Osmaston Park site makes an admirable exhibition ground, as the entrance from the London Road rather compels visitors arriving at that entrance to travel through the greater portion of the implement yard, and this does help exhibitors in that particular section, because, where a second entrance is provided, it often happens that a larger number of visitors particularly interested perhaps in stock do not avail themselves of the opportunity of visiting the implement section.

A public road crossing the site of the showyard at its very centre rather complicated the planning, but the difficulty was overcome by the construction of two level crossings with gates which were opened and closed by men in attendance, and which admitted visitors from one section of the showyard to the other. This was a very similar arrangement to that obtaining at Harrogate in 1929.

The Society is indebted to the Corporation of Derby, the London Midland and Scottish Railway Company, and the National Playing Fields Association, for kindly arranging for the site to be placed at its disposal.

The main entrance, with the administrative office, was erected on the London Road, whilst the second entrance was built near the Osmaston Road end of Park Road. Increased

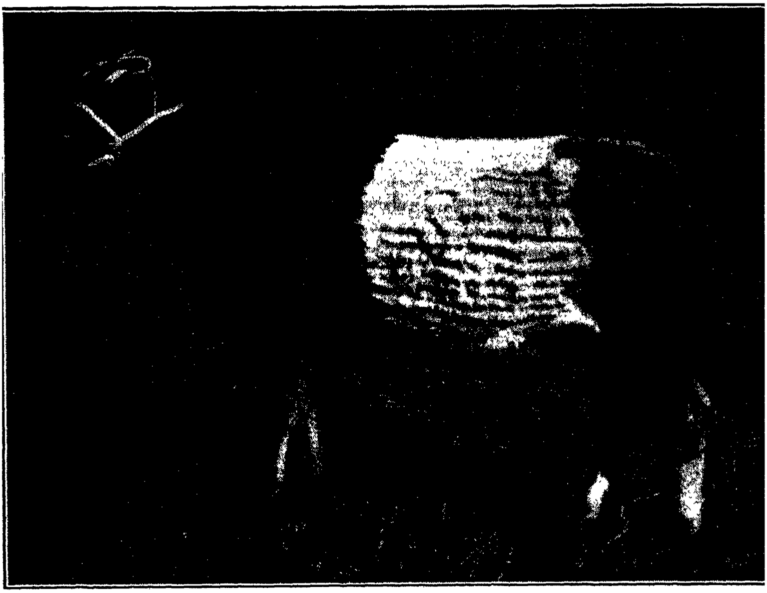


FIG. 3.—BELTED GALLOWAY HEIFER, "SHENLEY FRECKLES".
Winner of Champion Prize for best Belted Galloway, Derby, 1933.
Exhibited by MR. ROBERT CHRYSTAL IRVING.

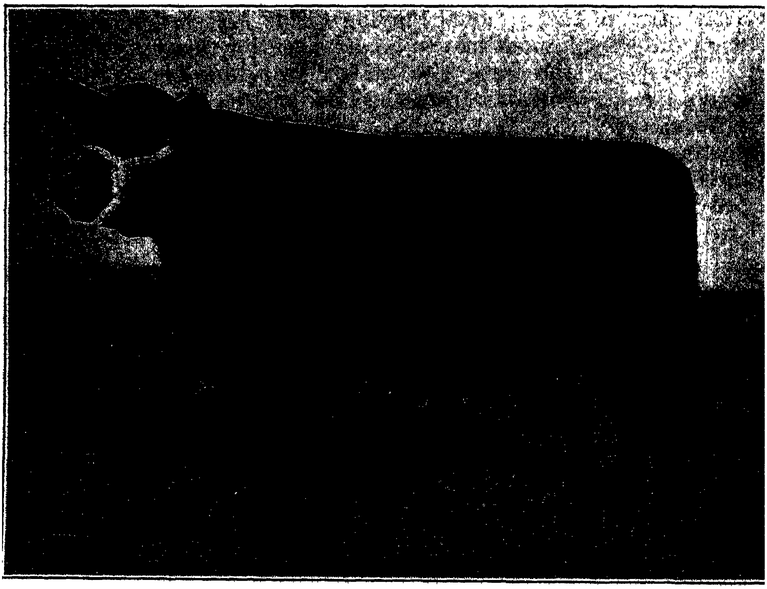


FIG. 4.—GALLOWAY HEIFER, "FAVOURITE 5TH OF KIRKLAND".
Winner of Champion Prize for best Galloway, Derby, 1933.
Exhibited by MR. FRANCIS N. M. GOURLAY.

car-parking facilities were provided in close proximity to these two entrances.

The total area of the site, excluding the motor parks, was 75 acres, or rather less than the area occupied in 1921, but as the avenues had been contracted it was found that more space could be occupied by stands and shedding, and this gave the showyard a more compact appearance in spite of the fact that the acreage was smaller than before. The motor parks occupied 40 acres.

As usual the various Breed Societies made liberal contributions to the prize fund, and the aggregate value of the prizes will be seen from the following summarized statement.

STATEMENT OF ENTRIES FOR THE 1933 SHOW, COMPARED WITH PREVIOUS YEARS.

Entries of Livestock, Poultry and Produce.

	Derby 1933.	Southampton, 1932.	Warwick, 1931.	Manchester, 1930.	Harrogate, 1929.	Nottingham, 1928.	Newport, 1927.	Reading, 1926.	Derby, 1921.
Horses .	592[1]	437[1]	568[1]	512[1]	634[1]	607[1]	429[1]	614[1]	601[1]
Cattle .	1,149[1]	1,009[1]	1,168[1]	1,164[1]	1,263[1]	1,261[1]	1,214[1]	1,640[1]	1,254[1]
Goats .	97[1]	75[1]	68[1]	48[1]	92[1]	61[1]	40[1]	67[1]	68[1]
Sheep .	573	520	569	735	723	591	524	724	788
Pigs .	688	551	688	678	691	833	664	986	902
Total .	3,099	2,592	3,061	3,137	3,403	3,353	2,871	4,031	3,613
Poultry .	984	840	741	901	943	1,036	887	1,111	1,219
Produce .	264	274	253	506	368	365	350	356	322

[1] Exclusive of Double Entries.

Shedding in Implement Yard (in Feet).

Description of shedding.	Derby, 1933.	Southampton, 1932.	Warwick, 1931.	Manchester, 1930.	Harrogate, 1929.	Nottingham, 1928.	Newport, 1927.	Reading, 1926.	Derby, 1921.
	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.
Ordinary .	2,095	1,845	2,190	2,690	2,995	3,035	2,875	3,360	4,595
Machinery	2,935	2,630	3,690	4,515	4,170	5,466	3,855	4,090	5,560
Special . (Seeds, Fertilizers, etc.)	3,360	2,450	3,083	3,488	3,686	3,501	2,756	3,420	3,835
Total . (Exclusive of Open Ground Space)	8,390	6,925	8,963	10,693	10,851	12,002	9,486	10,870	13,990
No. of Stands	349	311	388	443	431	467	369	446	508

Photo by] [*G. H. Parsons.*

FIG. 5.—DAIRY SHORTHORN BULL, "GREATTEW WATERLOO".
Winner of Champion Prize for best Dairy Shorthorn Bull, Derby, 1933.
Exhibited by SIR MARK COLLET, BART.

Photo by] [*G. H. Parsons.*

FIG. 6.—DAIRY SHORTHORN COW, "DEBDEN CHERRY BANDEAU".
Winner of Champion Prize for best Dairy Shorthorn Cow or Heifer, Derby, 1933.
Exhibited by SIR WILLIAM HICKING, BART.

All breeds were well represented, and only two breeds of sheep appearing in the schedule were deleted from the catalogue, owing to inability to obtain the number of entries required by the Society's regulations. Four classes for Commercial Pigs suitable for Pork or Bacon were for the first time included in the stock schedule.

It may be remembered that in 1921 the Derby Show was marked by an intensely hot period. This year the weather was bright and hot during the whole period of the Show, with the exception of about half an hour on the Friday afternoon, when there was a very heavy hailstorm. After this, however, the weather cleared and it was bright and warm for the closing day.

As usual the opening day was devoted to judging, and it may here be remarked that the charge for admission on this day which for the past twelve years had been 10*s.*, was reduced to the more popular price of 5*s.*

On Wednesday, Their Majesties The King and Queen honoured the Show by a visit.. They were staying as the guests of the President at Chatsworth, and drove from there by car to the boundary of the City of Derby. They there changed into the Royal Carriage, in which they drove through Derby, and entered the showyard at the London Road entrance, where they were met by the Hon. Director of the Show, and conducted to the Royal Pavilion, where they were received by the President and Members of Council.

After luncheon, Their Majesties inspected the cattle parade, certain events in the large ring, the flower show, the forestry section, the rural industries bureau, the model allotment garden for unemployed men, and, upon leaving, visited one of the most interesting features of the Show, a comprehensive exhibit organized by the Derby and Derbyshire Chamber of Commerce representing all the industries carried on in the county.

The following letter was received by the President on the day after the Royal visit :—

> MY DEAR DUKE,
>
> I hasten to let you and the Duchess know how greatly the Queen and I enjoyed our stay at Chatsworth. We were delighted to renew our acquaintance with your beautiful home, and you left nothing undone to make our visit a real pleasure.
>
> A notable addition to our happiness was to be found in the warmth of the welcome which we met wherever we went during these three days. The way in which the inhabitants, both of the town of Derby and the countryside, turned out in their thousands to greet us was most touching, and I should be glad if you, as my Lord Lieutenant, would let it be known how deeply we appreciated these displays of loyalty and affection.
>
> Again, the visit to the Royal Agricultural Show yesterday afforded me a welcome opportunity of meeting many of those who, like myself, are

Photo. by] [*O. Hoseg*

FIG. 7.—DORSET HORN RAM LAMBS.
Winners of Champion Prize for best Exhibit of Dorset Horn Sheep, Derby, 1938.
Exhibited by MR. W. RUPERT TORY.

FIG. 8—RYELAND SHEARLING RAM, "PRIORS DON".
Winner of Champion Prize for best Ryeland Shearling Ram, Derby, 1938.
Exhibited by MR. HERBERT N. MOORE.

deeply interested in agriculture, and at the same time of seeing some of its most recent developments.

I can well realize the amount of work which fell upon the authorities of the town and county of Derby in making the arrangements connected with our visit. Please express to them my sincere thanks and my congratulations on the evident success which attended their efforts.

Believe me,
Very sincerely yours,
GEORGE, R.I.

Attractive events in the ring were provided by H.M. Life Guards, who gave a musical ride and trick riding display, and by children of the Meynell Hunt who gave what was described as a Hunting Pageant, representing a day's fox hunting 150 years ago.

In the implement section one of the most outstanding features was the special exhibit organized by the Midland Colliery Owners' Association illustrating the use of coal for all purposes. This Association also organized a unique display of Pit Ponies which paraded each day in the large ring in charge of the boys who actually looked after them daily in the pits.

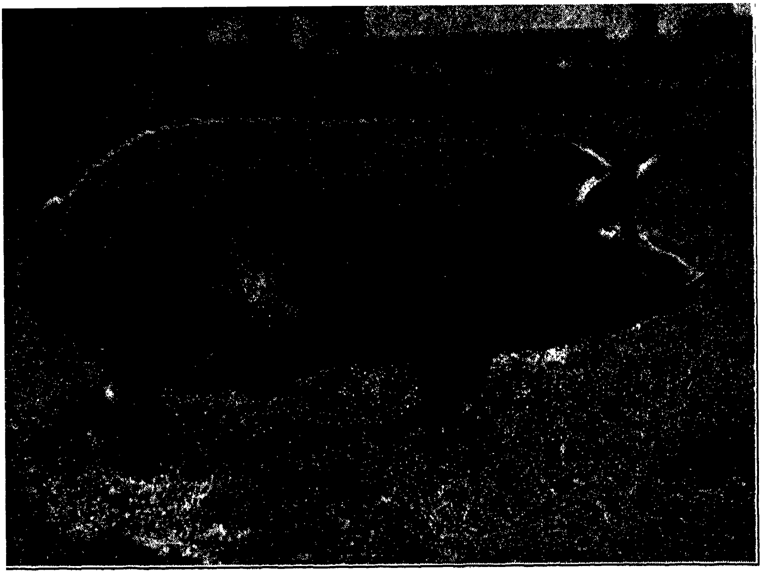
As a memento of the occasion each boy received a special certificate from the President of the Society, accompanied by a small sum of money for his own use.

A special Bureau for the reception of overseas visitors was again organized, and this was in charge of Sir Archibald Weigall and Colonel Stanyforth.

Visitors to the Derby Show included several Indian princes, cabinet ministers from the Dominions, colonial farmers interested in pedigree stock, and members of the British National Union from South Africa. On the Friday of the show week a special visit was arranged for members and delegates of the World Economic Conference. These delegates were received by the President ,who entertained them to luncheon, and after this, they were shown special parades of the champion cattle and heavy horses, as well as exhibits of outstanding merit in the implement section. Many expressions of gratitude were received from these visitors for the attention afforded to them and the information given.

The General Meeting of Governors and Members took place in the showyard on Thursday, when votes of thanks were accorded to the Mayor and Corporation, and the Derby Local Committee, for all they had done in connection with the Show.

The Y.M.C.A. again undertook the general welfare work for herdsmen and stockmen in the showyard. They provided reading and writing rooms, arranged concerts in the evenings, staffed the special refreshment bars, and in conjunction with the British Herdsmen's Club arranged sports for the men.



hoto by] [*G. S. McCann.*

FIG. 9.—TAMWORTH BOAR, "BERKSWELL UP TO DATE 4TH".
Winner of Champion Prize for best Tamworth Boar, Derby, 1933.
Exhibited by LT.-COL. C. J. H. WHEATLEY.

FIG. 10.—TAMWORTH BREEDING SOW "INGES PATIENCE 2ND".
Winner of Champion Prize for best Tamworth Sow, Derby, 1933.
Exhibited by MR. T. R. WILSON.

COMPARATIVE STATEMENT OF ENTRIES, &c.

AT TWO SHOWS HELD AT DERBY IN 1921 AND 1933.

HORSES, CATTLE AND GOATS.	1921.		1933.	
	Classes.	Entries.	Classes.	Entries.
HORSES				
Prizes		£4,004		£3,049
Shires	11	135	10	71
Clydesdales	9	61	5	31
Suffolks	10	72	12	87
Percherons	6	59	8	41
Hunters—				
Breeding Classes	10	63	10	102
Riding Classes	7	48	7	145
Polo and Riding Ponies—				
Breeding Classes	5	20	5	42
Hack and Riding Ponies	4	23	2	26
Arabs	2	9	—	—
Cleveland Bays	1	1	—	—
Coach Horses	1	1	—	—
Hackneys	6	29	—	—
Ponies	2	7	—	—
Welsh Ponies	3	12	2	10
Shetland Ponies	2	9	—	—
Children's Ponies	—	—	3	52
Driving Classes	13	52	9	74
Jumping	4	88	8	286
Total for HORSES	96	689	81	967[1]
CATTLE :—				
Prizes		£4,324		£6,409
Shorthorn	10	201	11	108
Hereford	8	101	9	40
Devon	6	31	5	23
Sussex	5	35	5	17
Welsh	5	41	5	18
Longhorn	3	10	4	20
Aberdeen-Angus	6	54	6	64
Belted Galloway	—	—	4	14
Galloway	5	15	4	26
Park Cattle	2	9	—	—
Dairy Shorthorn	9	150	10	171
Lincolnshire Red Shorthorn	7	79	7	50
South Devon	5	23	4	20
Red Poll	6	101	8	97
Blue Albion	8	24	6	21
British Friesian	7	118	13	151
Ayrshire	3	9	7	68
Guernsey	5	69	7	82
Jersey	7	103	7	119
Kerry	4	27	4	17
Dexter	4	54	4	23
Milk Yield	13	142	11	105
Butter Test	2	96	2	40
Total for CATTLE	125	1,492	143	1,294[1]
GOATS :—				
Prizes		£84		£110
Inspection Classes	12	68	9	97
Milk Yield	2	23	2	71
Total for GOATS	14	91	11	168[1]

SHEEP, PIGS, POULTRY AND PRODUCE.	1921.		1933.	
	Classes.	Entries.	Classes.	Entries.
SHEEP :—				
Prizes		£2,134		£2,197
Oxford Down	5	57	5	41
Shropshire	6	74	5	45
Southdown	6	63	7	79
Hampshire Down	6	61	5	46
Suffolk	6	37	6	60
Dorset Down	3	17	3	10
Dorset Horn	4	11	3	12
Wiltshire Horn	—	—	3	13
Ryeland	5	59	5	24
Kerry Hill (Wales)	4	36	5	41
Clun Forest	—	—	2	7
Lincoln	6	60	5	18
Leicester	4	38	4	12
Border Leicester	4	21	4	27
Wensleydale	5	26	5	29
Kent or Romney Marsh	6	95	6	35
Cotswold	4	27	—	—
South Devon	4	14	2	6
Dartmoor	3	9	2	13
Devon Long Wool	2	6	—	—
Lonk	3	7	2	—[3]
Devon Close Wool	—	—	2	6
DerbyshireGritstone	2	4	2	8
Swaledale	5	18	4	14
Herdwick	3	3	2	7
Exmoor Horn	3	3	—	—
Black-faced Mountain	3	17	—	—
Cheviot	3	6	2	—[3]
Welsh Mountain	2	14	2	12
Black Welsh Mountain	3	5	2	8
Total for SHEEP	110	788	95	573
PIGS :—				
Prizes		£1,600		£1,843
Large White	8	136	8	169
Middle White	8	130	8	119
Tamworth	6	28	6	28
Berkshire	8	133	8	49
Wessex Saddleback	6	32	6	46
Large Black	6	227	8	80
Gloucestershire Old Spots	8	137	6	29
Lincolnshire Curly Coated	5	26	—	—
Cumberland	6	23	5	18
Essex	6	30	6	35
Long White Lop-Eared	—	—	6	34
Welsh	—	—	4	25
Bacon Pigs	—	—	2	28
Porkers	—	—	2	28
Total for PIGS	67	902	75	688
POULTRY :—				
Prizes		£465		£414
Entries	151	1,219	123	984
PRODUCE :—				
Prizes		£298		£299
Entries	47	322	39	264

Grand Totals for LIVE STOCK, POULTRY, PRODUCE, &c., in 1933 } **567 Classes . 4938 Entries . £14,949 Prizes[2]**

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[1] Animals exhibited in more than one class are here counted as separate entries.

[2] Including £435 for Flower Show, £68 for Butter-Making Competitions, and £125 for County Classes.

[3] Classes cancelled under regulation of Prize Sheet.

The following tables give the particulars of admission to the Show in 1933, and a comparative statement, with six previous shows and the Derby Show of 1921.

Admissions by Payment at Derby, 1933.

Day of Show.	11 a.m.	1 p.m.	3 p.m.	5 p.m.	Day's total.
Tuesday (5*s.*) . .	1,225	2,351	2,932	3,143	3,171
Wednesday (5*s.*), after 2 p.m. (3*s.*) . .	4,323	10,822	19,198	21,390	21,684
Thursday (3*s.*) . .	6,216	18,134	24,460	26,560	26,981
Friday (2*s.* 6*d.*) . .	3,882	8,775	12,000	13,252	13,573
Saturday (1*s.*) . .	6,379	13,562	25,823	30,297	30,941
Total for Show					96,350

Total Daily Admissions at the 1933 *Show, compared with the previous six Shows and that at Derby in* 1921.

Day of Show.	Derby, 1933.	Southampton, 1932.	Warwick, 1931.	Manchester, 1930.	Harrogate, 1929.	Nottingham, 1928.	Newport, 1927.	Derby, 1921.
First .	3,171	1,116	1,887	2,483	3,884	2,388	1,214	3,791
Second .	21,684	8,165	11,273	14,352	23,598	18,244	7,515	33,979
Third .	26,981	11,686	24,198	31,115	51,252	44,293	19,456	33,931
Fourth .	13,573	11,997	15,193	14,943	18,924	14,775	10,528	31,777
Fifth .	30,941	14,614	19,708	38,025	26,359	28,977	23,654	22,350
	96,350	47,578	72,259	100,918	124,017	108,677	62,367	125,828

The surplus receipts over expenditure for this Show was £1,394.

In view of the intensive effort made to attract visitors to the Derby Show, and the increased amount spent on advertising, the financial result may perhaps be a little disappointing, but, in view of the agricultural and industrial conditions prevailing in the country, it is, I think, a matter for congratulation that the Society has been able to organize the Derby Show without incurring a loss.

T. B. TURNER.

16, Bedford Square,
London, W.C.1.

REPORT ON NEW IMPLEMENTS ENTERED AT THE DERBY SHOW, 1933.

THE number and variety of machines entered for the Silver Medal this year is evidence of continued enterprise on the part of our agricultural engineers and is gratifying to the Society.

As in former years, the Judges have personally inspected the entries at work, and have had the benefit of reports from the Society's Consulting Engineer and, in certain cases, from Research Institutes specially concerned with particular types of machinery.

The total number of entries was 13, but one of these, a seed drill entered by Messrs. Ransomes, Sims and Jefferies, was deferred until 1934. Of the remaining 12, five were awarded Silver Medals; two of these fell into the class of harvesting machinery, two into that of cultivating machinery and the last was a barnyard machine.

SUCCESSFUL ENTRIES.

I. Grass Elevator—Entered by John Wilder, Reading.

The high nutritive value of young grass has been proved beyond doubt by feeding experiments, but the problems of its collection and preservation present obvious difficulties. The apparatus of Messrs. Wilder is designed to facilitate the collection of the crop. It consists of an elevator attached to the cutter bar of a standard mowing machine. The elevator consists of chains, to which slats carrying prongs are attached. The chains are driven from mower-type wheels on which the elevator is mounted, and the prongs sweep the cut material from a plate fixed to the cutter bar and raise it to a gap close to the top of the elevator trough. The material falls through this gap into a light trailer towed behind the outfit. The elevator is so attached to the mower frame that, while some freedom of vertical movement is permitted, no part of the pull is taken by the cutter bar.

The machine was tried under the supervision of the Institute for Research in Agricultural Engineering on two types of crop:—

(*a*) long clover (at Benson, near Oxford).

(*b*) short grasses of about 5" height (by the courtesy of Imperial Chemical Industries Ltd., at Jealotts Hill).

The machine was inspected by the Judges at the latter Station, and in their judgement worked very satisfactorily, as it did also at the Institute's Station at Benson. A standard cutter bar was used on the clover and a twin-finger bar on the short grass. No trouble was experienced in either case with the elevator, and the cut material was all delivered into the cart without clogging. The ground behind was left quite clear and no subsequent raking was necessary. Square corners could not be cut except by turning in a left-handed loop, while the trailer provided held only 6 cwt. of green material and would be too small for regular work.

This machine appears to solve the problem presented by the collection of short grass, and, since it enables a new principle in stock feeding to be economically applied, it was considered to be specially worthy of a Silver Medal.

II. Potato Digger—Entered by Messrs. Blackstone & Co., Ltd., Stamford.

This is a potato digger of the two-spinner type and embodies the following improvements :—

The axis of the main spinner is tilted so that the curved twin tines rise out of the ground after leaving the loosening share. This action, in conjunction with the crank control of the tines, raises the tubers without any tendency to carry the tops around. Both the main spinner and the loosening share are mounted on a tilting frame so that the pitch of the share can be altered. The auxiliary spinner is fitted with patent curved double tines, is mounted so as to float on a spiral spring, and is adjustable in both directions.

The digger was used to lift about 5½ acres of early potatoes on a farm at Boars Hill, near Oxford. Owing to lack of rain during the latter part of the growing period the crop was light (about 2 tons per acre) and the potatoes were small. During most of the digging the land was exceedingly dry and dusty. Under these conditions the potatoes were raised and left uncovered quite satisfactorily but, at the start of the work, were distributed over a rather wide area.

The Judges were very favourably impressed on account of the small amount of damage done to the tubers. It proved necessary to make certain adjustments in order to reduce the area over which the potatoes were distributed; and, as the result of experience gained during the digging of the first acre or two, the working of the machine was improved and this disadvantage overcome, the potatoes then being left much more conveniently distributed for picking.

A special visit was made to see the first field (3½ acres) harrowed after digging. So little ware had been left that the grower did not consider it worth while to pick over the field again.

Particularly where the lifting of early potatoes is in question, the machine, although it involves no new principle, appeared to be a definite improvement on any previous machine. A Silver Medal was accordingly awarded.

III. Potato Planter—Entered by A. C. Bamlett, Thirsk, Yorks.

This machine is a conveyor type planter in which potatoes are picked up from a hopper by the fingers of the conveyors and are carried down to the delivery spouts (which are placed close to the ground) and are then dropped into the furrows. The conveyors are chain driven from the land wheels.

Special features are that the potatoes in the hopper are continually agitated by a shaker; that an arrangement is provided for ejecting surplus potatoes from the fingers; and that a knife is provided on each conveyor which cuts unusually large potatoes and so avoids blocking.

The wheels and spouts are adjustable to 26, 28 or 30 inch rows, while the distance apart at which potatoes are dropped can be altered by changing the chain sprockets.

Both a two-row and a three-row machine were used, on Mr. John Bell's farm at Thirsk, to plant early and main crop potatoes. The early potatoes were Sharpe's Express and the seed was a very even sample. The main crop potatoes were Great Scot and the sample of seed was rather uneven, both in size and shape. Both varieties were planted at 14 inch distance in rows 28 inches apart. The rate of planting was about 2 acres per hour with the three-row machine and 1½ acres per hour with the two-row machine.

Both kinds of potatoes were picked up cleanly from the hopper by the fingers of the conveyor and appeared to be delivered fairly regularly by the machine. On account, however, of the dryness of the ground and of the farmyard manure on which the potatoes were planted, the seed had a tendency to bounce when dropped. As a result the planting was not very uniform. A count of the final plant showed that only 2 per cent. of the full plant was missing, but apart from these gaps the distances between adjacent potatoes varied from about 8 to 20 inches. Most farmers would, in the circumstances, have arranged for one or more boys to follow the machine in order to adjust the spacing by hand, but even so there would have been an appreciable saving of labour over hand planting.

The Judges considered that the simplicity of design of this machine was a very good feature and in view of its efficient performance in the field awarded it a Medal.

IV. Dunlop Pneumatic Tyred Cart Wheels—Entered by The Dunlop Rubber Co., Ltd., Fort Dunlop, Erdington, Birmingham.

The equipment which forms the subject of this entry aims at applying the advantages of pneumatic tyres and roller bearing hubs to carts and other farm vehicles.

The wheels are of the pressed steel artillery type with well-base rims and are secured to roller bearing hubs by five studs. The tyres are of nominal size 8.00–19 in. and are built up on a six-ply foundation with a buttressed tread. The rubber used in their construction is stated to be specially compounded to resist farmyard acids.

The normal working pressure is 30 lb. per sq. in.

These wheels have been tested under the Ministry of Agriculture's Testing Scheme and full details of the tests are given in the Ministry's Report No. 46, copies of which were supplied to the Judges. The following conclusions are taken from the certificate of test:—

1. The draught of a farm cart, fitted with Dunlop pneumatic-tyred land wheels, was found under all conditions of test to be less than that of the same cart carrying the same load on iron-tyred wheels.

   The reduction in draught, due to the use of Dunlop wheels, varied from 13 per cent. to 41 per cent., according to the load carried and the type of land traversed.
2. When the Dunlop wheels were fitted the pay load that could be carried for the same draught was always greater than when the ordinary wheels were used.

   The increase in pay load due to the use of the Dunlop wheels varied from 35 per cent. to 108 per cent., according to the ground conditions.
3. The wheels and tyres remained in good condition throughout the three months covered by the tests.

It is also stated in the Report that where continual passage of one piece of ground was necessary, the ground was much less cut up by the Dunlop wheels than by the ordinary wheels.

The Judges consider that these wheels represent a considerable advance in farm cart design. Very big savings in draught result from their use and a much greater load can be carried without increasing the effort of the horse. The tyres, so far as a rather short test can decide, appear to wear well in practice and if this impression is confirmed by experience they are likely to come into general use in the near future. A Silver Medal was awarded.

V. Vegetable Shredders—Entered by W. L. Holland, Adelphi Works, Preston, Lancs.

These machines incorporate an entirely new principle and are designed to reduce vegetables of all kinds to a pulp suitable for mixing with poultry mashes and similar feeding stuffs. Two different machines were supplied for test, one being intended for use with all types of root crops, while the other was for cabbages, etc. In both cases the working principle is a cast-iron drum in which saw-toothed steel tape is inserted to form a multiple threaded screw. In the root machine this drum rotates at 600 r.p.m. and the roots bounce about on the surface of the drum inside a suitable container. In the cabbage shredder the drum runs at about 1,500 r.p.m. and the cabbages are pressed along a reciprocating table against the surface by means of a hand-operated ram.

In both machines the resulting product is delivered into a bin fitted under the drum.

Short tests of both machines were carried out by the Institute for Research in Agricultural Engineering, from whose report the following particulars are taken :—

Root Machine.

Material used : mangolds and potatoes.

Average rate of shredding : 9 cwt. per hour.

Power required running light : 1·4 h.p.

Power required working : 1·5 to 7 h.p. according to the number of roots on the roller.

Cabbage Machine.

Material used : spring cabbage.

Average rate of shredding : 5 cwt. per hour.

Power required running light : 2·5 h.p.

Power required working : 3 to 9 h.p. according to the pressure exerted by the operator.

In both cases the working of the machine was efficient and clean, and no trouble was experienced.

The machines were particularly well constructed and were arranged so as to be easily accessible for cleaning. Most ingenious safety devices were fitted which avoided all possibility of danger to the operator even when he had had no previous experience of the machine. The Judges considered that the ingenious design of the machines and the excellent work which they did fully entitled them to the award of the Silver Medal.

UNSUCCESSFUL ENTRIES.

VI. Reversible Motor Car Hay Sweep—Entered by the Hosier Open Air Pure Milker Ltd., Wexcombe, Marlborough.

This is a hay sweep consisting of ten wooden tines, mounted in one plane on two cross members, and provided with eccentric iron points. It is designed to be attached to the dumb-irons of a motor car and its principal novelty is its extreme simplicity. It has no wheels, self-lift mechanism or side guards, and it is very simply attached to the car by clamping two angle irons over the projecting bolts on the dumb-irons. The eccentric points are of special design, and since the whole sweep is reversible, they can be brought nearer to or farther from the ground as required.

The Judges of Implements had an opportunity of seeing this sweep at work collecting both hay and green forage for ensilage. The ground was not ridged, but was otherwise not specially smooth. With both types of crop sweep loads were brought in quite regularly at from 10 to 15 m.h.p. and no hitch in any way attributable to the hay sweeps occurred. The hay was delivered to a stacker while the silage was delivered to an elevator. The advantage of the motor car sweep over a tractor sweep, due to the former's higher speed, was very noticeable and the rate at which the crops were got into the rick was very rapid.

Sweeps of this type have been observed at work over a full haymaking season and there is no doubt that on flat land they enable the gathering of hay to be done more rapidly than by any other means.

The simple means of attachment to the car works quite satisfactorily in practice, while the type of point used on the tines successfully prevents their digging into the ground. On one occasion a car fitted with this type of sweep was seen to bring a number of loads across the ruts of a cart-track without any stoppage. On ridge-and-furrow land collection can be done quite normally along the ridges, but great caution is necessary when crossing them.

On a field of average size a sweep of this type can gather upwards of 15 tons of hay per day.

In effect, however, the sweep varies little from other makes excepting as regards its adaptation for driving with a car, and although the Judges appreciate the ingenuity of this adaptation and the advantages that are likely to result from it they feel that the apparatus does not embody sufficiently novel ideas to justify them in making an award.

VII. Tractor Wheels—Entered by Messrs. Miller Wheels Ltd., Orpington, Kent, at Southampton in 1932 *and deferred by the Judges of Implements until this year.*

These wheels were formally tested last year and a description of them, and of the tests, were given in the report on the 1932 entries. That report stated that the tests did not indicate that these wheels had any advantages over those usually supplied, as standard, by tractor makers. Since, however, the tests did not cover actual farm work, the Judges decided to defer the entry so that further trials could be made, in order to decide whether the wheels possessed any advantages in practical working.

The working of these wheels on a Norfolk farm has since been observed at intervals, but no definite conclusion as to their efficiency has been reached. On some occasions they performed satisfactorily and possibly better than other wheels would have done. On the other hand they have, on at least one occasion, been observed to dig themselves in when ploughing so that the tractor had to be hauled out. This occurred on light land under conditions in which the standard type of wheel had no difficulty in working.

One definite advantage of the wheels is that narrow cleats can be fitted if desired so that a tractor fitted with these wheels can be used for hoeing root crops. This, however, is not the only type which possesses this feature, and the Judges did not consider that these wheels possessed sufficient advantages over other types to be given an award.

VIII. S.A.I. Seed Dresser—Entered by Messrs. Barclay Ross & Hutchison Ltd., 67–71, *Green, Aberdeen.*

This machine is intended for dressing seed grain with small quantities of chemical powder. The dressing is carried out in a rotary drum of galvanized steel, with fixed internal vanes, which is provided with a trap-door for cleaning out. The grain and the powder dressing are fed in at one end from separate specially designed hoppers, while the dressed grain passes out in a continuous stream from the other end. The grain hopper has an adjustable slide to control the rate of flow while the chemical hopper has a special slide, which is set by the makers before delivery, and is also provided with an agitator. The drum is turned by hand and a belt drive from the axle drives the agitator.

The machine was tried at the Norfolk Agricultural Station on wheat, oats and barley. It was found necessary for efficient working to keep the speed of working close to that specified by the makers (50 r.p.m.). At this speed the full output of 12 sacks (48 bushels) per hour was maintained. Examination of typical samples under a microscope showed that all the grains were well covered with an even coating of the chemical dressing. The machine was used to dress all the spring seed sown at the Station, and worked efficiently throughout.

The average consumption of the dressing (Ceresan) was 8 oz. per sack, costing 11½*d*., while the cost of labour in dressing was about 2*d*. per sack.

The machine appeared to be stoutly built and was fully dustproof. It should have a long life in practice.

While the Judges were favourably impressed with the work that was done, they did not feel that the design of the machine embodied any principles which could be regarded as entire innovations, and were therefore unable to make an award to this entry.

IX. Potato Sorter—Entered by Mayor & Sons, Ltd., 6, *Wharf Street, Preston, Lancs.*

This is an arrangement of riddles in a frame designed to allow one or two men to sort and bag potatoes rapidly. The main riddle (for which various sizes of sieve can be provided) is suspended from the frame in such a way that when horizontal it can be rocked sideways in order to riddle the potatoes, while by means of a pulley and a counter-weighted rope, one end can be lowered to shoot the ware into sacks. The seed and chats pass through into a second riddle which allows the dirt to fall away.

The machine was used by two men to bag 15 cwt. of potatoes from a clamp. The time taken was rather under four hours. Too large a riddle had been fitted for the particular sample sorted and the ware left on the riddle amounted to only about half of the original sample taken from the clamp. With a smaller riddle a greater output would have been attained.

The rate per man per day was about 15 cwt.

The Judges considered that the machine resembled other types too closely to merit an award.

X. Open-Air Poultry Pen—Entered by the Hosier Open Air Pure Milker Ltd., Wexcombe, Marlborough.

This is a poultry pen of triangular section, constructed of wood framing and wire netting, designed to house 25 birds and to enable them to be run in large numbers among cattle or other stock.

The pen is a combination of a slatted-floor hut with an open run, and includes a feeding hopper, water container and patent nest trays designed to prevent eggs from becoming fouled or broken. It also includes an ingenious lever device by means of which it may be moved by one person.

A pen was supplied to the National Institute of Poultry Husbandry for test and was used to house 25 White Leghorns from May 7 to June 23.

The Judges also had an opportunity of observing the Hosier system of Poultry Keeping in actual practice and were impressed by the following advantages :—

1. Cattle can run on the same field without any damage to the houses.
2. The birds are moved on to fresh ground and grass daily, thus reducing the danger of disease.
3. The birds are in small isolated units ; thus disease, if it does break out, is not likely to spread throughout the whole flock.
4. The movement of the birds over wide areas improves the fertility of the pasture.

These advantages were, however, a feature of the system rather than of the pen itself, which did not, in the opinion of the Judges, constitute a sufficient advance on other designs to merit an award.

XI. *Electric Sterilizing Chest—Entered by The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.*

This entry consists of a sterilizing chest of well-known pattern which has been converted so as to be operated electrically. A water container holding about 7 gallons is fitted beneath the chest and is provided with a filling funnel and a run-off tap. The water is heated by electric immersion heaters, which are suspended in the container and are connected up to a switch and tell-tale lamp mounted on the cabinet. A thermometer and a water gauge are also provided.

A test carried out by the National Institute for Research in Dairying showed that the chest submitted conformed in all respects to the specification supplied by the entrants.

The sterilizing chest worked efficiently and had the advantage of promoting cleanliness since no stoking, ash raking, etc., were necessary. It would also save floor space. In many cases, however, where a steam boiler is used to heat a chest of this kind the steam would be used for other purposes for which the boiler would in any case be essential.

Except where very favourable rates for electricity were available, sterilizing by means of this chest would be more expensive than by means of a steam boiler, and the overall time of the operation would also be longer with electricity. The Judges considered that, while the chest constituted a normal and useful extension of the uses of electricity, it did not contain any very novel or remarkable feature.

XII. Auto-Recording Milking Plant—Entered by Messrs. Gascoignes (Reading) Ltd., Reading.

This plant consists of a six-stall milking bail fitted with a three-stall Gascoigne milking plant. The stalls and the general design of the milking machine differ very little from the plants entered in previous years and embody no new features.

The detailed design has, however, been modified so as to allow milk-recording to be carried out almost automatically. By means of a control tap, milk from each cow is delivered into a separate glass vessel mounted on a spring balance and each cow's output can therefore be weighed. After the milking of each cow is finished, a movement of the control tap empties the glass vessel under vacuum and delivers the milk into a collecting vessel whence it passes over a cooler. The collecting vessel and cooler are placed in a dairy compartment built on to the end of the bail.

Tests of the plant are being carried out by the National Institute for Research in Dairying, but the Judges considered that these tests had not been in progress for long enough, at the time of the show, to enable them to decide as to the merits of the entry. They therefore deferred the entry until 1934.

THOMPSON CLOSE.

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REPORT OF THE STEWARD OF DAIRYING, DERBY SHOW, 1933.

MILK YIELD TRIALS.

CATTLE CLASSES 202 to 212.

THE number of entries in the Milk Yield Trials at the Derby Show was 105. Of this number 80 competed, 49 of which were thrice milked.

In the Dairy Shorthorn Class "Lowgroves Beauty 5th" with a milk yield of 69¾ lb., an average fat percentage of 3·46 and 83·59 total points, was awarded the first prize.

TABLE I.—MILK YIELD CLASSES AT DERBY, 1933.

No. in Catalogue.	Exhibitor.	Name of Cow.	Date of Birth.	Date of last Calf.	No. of days in Milk.	Date of last Service.	Milk Yield. Morning.	Milk Yield. Noon.	Milk Yield. Evening.	Milk Yield. Total.	Average Fat percentage.	Points. Milk.	Points. Average Fat per cent. × 4.	Points. Lactation.	Points. Total.	Awards and Remarks.
Class 202		Dairy Shorthorn. Thrice Milked.		1933		1933	Lb. oz.	Lb. oz.	Lb. oz.	Lb. oz.						
1059	Fredk. Chapman	Lowgroves Beauty 5th	July 18, 1926	June 8	25	—	26 12	19 8	23 8	69 12	3.46	69.75	13.84	Nil	83.59	First Prize
1064	Kidner Bros.	Stokeleycross Cherryblossom 5th	May 2, 1926	May 17	47	—	27 12	19 0	22 8	69 4	2.83	69.25	11.32	.70	81.27	Fat below standard
Class 202		Dairy Shorthorn. Twice Milked.														
1062	E. Uwins Gillate	Orfold Jessy 2nd	Nov. 29, 1925	April 7	87	June 15	33 8	—	27 12	61 4	3.25	61.25	13.00	4.70	78.95	Second Prize
1067	J. Spencer Taylor	Pinkneys Lilian	April 10, 1926	May 22	42	—	33 12	—	28 8	62 4	2.55	62.25	10.20	.20	72.65	Fat below standard
1078	Duke of Westminster, G.C.V.O., D.S.O.	Lawnhead Moss Rose 20th	Aug. 21, 1927	May 6	58	—	34 12	—	30 0	64 12	3.10	64.75	12.40	1.80	78.95	Third Prize
1097	Duke of Westminster, G.C.V.O., D.S.O.	Lawnhead Quicklime 3rd	May 10, 1928	June 4	29	—	28 0	—	31 0	59 0	3.50	59.00	14.00	Nil	73.00	H.C.
1110	J. Spencer Taylor	Whatcote Rosamond	July 6, 1929	June 10	23	—	33 4	—	28 12	62 0	3.05	62.00	12.20	Nil	74.20	Reserve
1114	Duke of Westminster, G.C.V.O., D.S.O.	Lawnhead Charming Lass 9th	May 20, 1929	May 6	58	—	25 8	—	25 8	51 0	3.65	51.00	14.60	1.80	67.40	H.C.
Class 203		Lincolnshire Red Shorthorn. Thrice Milked.														
1169	John Evens & Son	Burton Royal Starlight 13th	April 20, 1927	May 11	53	—	23 8	16 0	18 4	57 12	3.30	57.75	13.20	1.30	72.25	Reserve
1174	John Evens & Son	Burton Amy 14th	June 22, 1926	May 16	48	—	19 8	16 12	17 4	53 8	3.06	53.50	12.24	.80	66.54	H.C.
1175	John Evens & Son	Burton Priory Lady 7th	June 16, 1927	May 28	36	—	25 4	16 0	20 4	61 8	2.86	61.50	11.44	Nil	72.94	Fat below standard
1178	F. Sainsbury	Bendish Poppy 9th	Feb. 28, 1925	Mar. 24	101	—	24 4	16 0	17 8	57 12	3.68	57.75	14.72	5.00	77.47	Second Prize
1181	Russell Wood	Bendish Cherry 27th	Feb. 21, 1927	June 16	17	—	22 0	17 12	21 0	60 12	4.16	60.75	16.64	Nil	77.39	Third Prize
1182	Russell Wood	Bendish Sunbeam 10th	May 16, 1928	June 9	24	—	25 4	21 0	23 4	69 8	3.26	69.50	13.04	Nil	82.54	First Prize
Class 203		Lincolnshire Red Shorthorn. Twice Milked.														
1179	Scothern Dairy Co.	Scothern Mistress 5th	June 1, 1926	May 7	57	—	29 4	—	25 12	55 0	2.80	55.00	11.20	1.70	67.90	Fat below standard
Class 204		South Devon. Thrice Milked.														
1210	Dartington Hall Ltd.	Milkmaid 33rd	Feb. 10 1926	Mar. 19	106	June 7	30 8	24 12	27 0	82 4	3.60	82.25	14.40	6.60	103.25	First Prize
1212	Dartington Hall Ltd.	Dartington Welcome 2nd	1926	May 12	52	June 21	30 4	28 8	23 8	82 4	3.71	82.25	14.84	1.20	98.29	Second Prize.
1213	Dartington Hall Ltd.	Zempson Margaret	Sept. 2, 1926	June 7	26	—	28 12	19 0	19 12	67 8	4.60	67.50	18.40	Nil	85.90	Third Prize
1218	Miss Jervoise Smith	Dittisham Nina 2nd	June 9, 1925	May 17	47	—	22 4	13 4	16 0	51 8	4.25	51.50	17.00	.70	69.20	Reserve
Class 205		Red Poll. Thrice Milked.														
1274	Mrs. M. L. Griffith	Grundisburgh Ruby	Sept. 30, 1926	May 22	42	—	20 0	18 0	18 8	56 8	2.96	56.50	11.84	.20	68.54	Fat below standard
1275	J. N. Kendall	Newton Bertha	Mar. 8, 1924	May 4	60	—	20 12	17 12	19 8	58 0	3.25	58.00	13.00	2.00	73.00	Second Prize
1276	Lady Loder	Horsley Norah	Mar. 20, 1925	June 2	31	—	17 8	13 8	17 12	48 12	3.90	48.75	15.60	Nil	64.35	Reserve
1279	The Hon. Clive Pearson	Kettleburgh Rosie 27th	Sept. 21, 1923	May 29	35	—	10 4	8 8	10 8	29 4	4.10	29.25	16.40	Nil	45.65	Insufficient points
1285	Charles Henry Cearn	Heveningham Daring	Dec. 7, 1928	April 22	72	—	18 4	13 12	14 8	46 8	4.60	46.50	18.40	3.20	68.10	Third Prize
1286	John George Gray	Basildon Royal Rosie 8th	Oct. 14, 1928	Feb. 19	134	April 19	19 12	17 4	16 12	53 12	2.70	53.75	10.80	0.40	73.95	Fat below standard

MILK YIELD CLASSES AT DERBY, 1933 (*continued*).

No. in Catalogue	Exhibitor.	Name of Cow.	Date of Birth.	Date of last Calf.	No. of days in Milk.	Date of last Service.	Milk Yield.								Average Fat percentage.	Points.				Awards and Remarks.
							Morning.		Noon.		Evening.		Total.			Milk.	Average Fat per cent. × 4.	Lactation.	Total.	
							Lb.	oz.	Lb.	oz.	Lb.	oz.	Lb.	oz.						
Class 205		**Red Poll. Twice Milked.**		1933		1933														
1271	His Majesty The King .	Necton Daffodil	Sept. 18, 1923	Feb. 25	128	April 20	24	0	—		24	4	48	4	4.10	48.25	16.40	8.80	73.45	First Prize
Class 206		**Blue Albion. Thrice Milked.**																		
1332	Charles Henry Webster	Ivonbrook Vera	July 20, 1927	June 3	30	—	19	0	17	4	21	0	57	4	3.63	57.25	14.52	Nil	71.77	Second Prize
Class 206		**Blue Albion. Twice Milked.**																		
1326	T. H. Calderbank . .	Stow Pansy	Aug. 26, 1926	May 5	59	—	31	12	—		28	4	60	0	3.17	60.00	12.68	1.90	74.58	First Prize
1328	Henry Matthews . .	Winterbourne Daffodil . . .	April, 1928	Mar. 30	95	—	20	0	—		17	4	37	4	3.55	37.25	14.20	5.00	56.45	Insufficient points
Class 207		**British Friesian. Thrice Milked.**																		
1409	Arthur Barber . . .	Limestone Snowdrop . . .	Feb. 14, 1925	April 28	66	—	23	0	19	8	25	0	67	8	3.05	67.50	12.20	2.60	82.30	Reserve
1410	Miss E. J. Butler . .	Rednal Queenie	Aug. 6, 1924	Jan. 8	176	April 9	26	0	22	0	23	8	71	8	3.18	71.50	12.72	Nil	84.22	Fifth Prize
1411	John E. Castle . .	Curbridge Flora	Nov. 1, 1925	June 9	24	—	29	0	24	0	25	12	78	12	3.33	78.75	13.32	Nil	92.07	Third Prize
1413	Capt. H. Douglas . .	Farley Dame	April 26, 1927	June 19	14	—	24	0	19	4	19	8	62	12	2.58	62.75	10.32	Nil	73.07	Fat below standard
1417	T. E. Gladstone . .	Dignit Lonely Lass	July 3, 1924	May 25	39	—	29	0	23	8	27	0	79	8	2.71	79.50	10.84	Nil	90.34	Fat below standard
1420	Trustees of Sir A. W. MacRobert, Bart.	Douneside Molly 3rd . . .	May 8, 1926	June 18	15	—	22	4	19	12	21	0	63	0	3.95	63.00	15.80	Nil	78.80	H.C.
1421	Lord Rayleigh . . .	Terling Profit 9th	July 2, 1927	May 22	42	—	26	12	24	0	26	0	76	12	2.70	76.75	10.80	.20	87.75	Fat below standard
1424	Strutt & Parker (Farms) Ltd.	Lavenham Jess 2nd	Aug. 13, 1925	May 23	41	—	27	12	23	0	27	8	78	4	2.86	78.25	11.44	.10	89.79	Fat below standard
1425	Strutt & Parker (Farms) Ltd.	Lavenham Sea Breeze 4th . .	Aug. 12, 1926	June 3	30	—	30	4	21	8	20	12	72	8	3.05	72.50	12.20	Nil	84.70	Fourth Prize
1427	E. G. Barton . . .	Combermere Eleanor 2nd . .	Nov. 6, 1928	June 11	22	—	33	8	28	8	30	8	92	8	3.71	92.50	14.84	Nil	107.34	First Prize
1429	Frank William Gilbert .	Hughlea Akrin's Nancy . .	Feb. 17, 1928	June 12	21	—	25	8	19	12	23	0	68	4	2.91	68.25	11.64	Nil	79.89	Fat below standard
1430	Frank William Gilbert .	Killis Queen Belle	Nov. 29, 1929	June 13	20	—	30	8	23	4	26	0	79	12	3.21	79.75	12.84	Nil	92.59	Second Prize
Class 208		**Ayrshire. Thrice Milked.**																		
1506	Comdr. E. W. Billyard-Leake	Dalgig Lady Maud 3rd . . .	June 3, 1925	June 12	21	—	28	0	20	8	22	8	71	0	4.40	71.00	17.60	Nil	88.60	Third Prize
1511	Eshott Pedigree Stock Farms	Auchenbrain Miss Craig 34th.	Mar. 9, 1924	May 24	40	—	32	4	24	4	27	12	84	4	3.26	84.25	13.04	Nil	97.29	First Prize
1527	Lt.-Comdr. C. G. Vyner	Cowdens Jem 2nd . . .	Aug. 21, 1921	May 3	61	—	29	8	22	12	25	4	77	8	3.61	77.50	14.44	2.10	94.04	Second Prize
Class 209		**Guernsey. Thrice Milked.**																		
1595	Esmond D. Fairweather	May Boy Daisy of the Blanche	June 6, 1924	June 12	21	—	25	8	21	12	23	8	70	12	3.92	70.75	15.68	Nil	86.43	First Prize
1597	Carl Holmes . . .	Dairy Nellie's Queen . . .	Mar. 16, 1925	April 20	74	June 10	20	4	13	12	14	4	48	4	5.18	48.25	20.72	3.40	72.37	Third Prize
1602	Mrs. J. Sutcliffe Pyman	Sequels Maybelle 4th . . .	July 6, 1927	May 22	42	—	21	0	17	4	18	4	56	8	3.71	56.50	14.84	.20	71.54	Reserve
1605	Lord Swaythling . .	Otterbourne Sylvia	Sept. 7, 1928	Mar. 29	96	June 21	21	12	19	0	21	4	62	0	4.13	62.00	16.52	5.60	84.12	Second Prize
1618	Lord Swaythling . .	Dorina of the Valinguet . .	Dec. 8, 1929	May 13	51	—	17	0	16	0	18	4	51	4	3.01	51.25	12.04	1.10	64.39	H.C.
1619	W. G. Trower . . .	Stanstead Rose 59th . .	Feb. 14, 1929	May 27	37	—	17	8	15	4	13	12	46	8	3.80	46.50	15.20	Nil	61.70	H.C.

Class 209		**Guernsey. Twice Milked.**														
1616	Mrs. Evelyn Rich	Silverstead Nina	Aug. 10, 1929	Feb. 6	147	April 27	21 4	—	18 12	40 0	5.05	40.00	20.20	10.70	70.90	H.C.
Class 210		**Jersey. Thrice Milked.**														
1681	Mrs. Evelyn	Wotton Early Minx	Jan. 14, 1928	May 25	39	—	23 0	20 12	24 0	67 12	3.60	67.75	14.40	Nil	82.15	Second Prize
1686	Capt. R. S. Hall	Cosy	Mar. 13, 1927	April 18	76	May 29	19 12	17 4	18 4	55 4	4.06	55.25	16.24	3.60	75.09	Reserve
1690	Capt. E. L. Hughes, R.N.	Princess Peggy	Oct. 24, 1928	June 20	13	—	22 0	17 0	19 8	58 8	4.65	58.50	18.60	Nil	77.10	Fourth Prize
1726	Lady Walston	Newton Queen 4th	April 16, 1930	April 17	77	—	19 8	13 12	16 8	49 12	4.41	49.75	17.64	3.70	71.09	H.C.
Class 210		**Jersey. Twice Milked.**														
1678	Grosvenor Berry	Black Art's Postgirl	Mar. 20, 1928	Mar. 24	101	June 23	30 12	—	21 12	52 8	4.52	52.50	18.08	5.00	75.58	Fifth Prize
1679	Grosvenor Berry	Excess Postage	Mar. 26, 1929	Feb. 10	143	April 18	23 8	—	19 0	42 8	4.87	42.50	19.48	10.30	72.28	H.C.
1680	Grosvenor Berry	March Dinah	Mar. 21, 1928	Mar. 21	104	June 19	34 0	—	28 12	62 12	4.32	62.75	17.28	6.40	86.43	First Prize
1687	Mrs. Henry Hawkins	Jim's Queen of Spades	Mar. 30, 1928	April 26	68	June 18	18 12	—	25 0	43 12	3.67	43.75	14.68	2.80	61.23	H.C.
1699	H. S. Mountain	Sir Laurel's Berthe	July 26, 1926	Feb. 12	141	May 8	23 4	—	18 12	42 0	5.40	42.00	21.60	10.10	73.70	H.C.
1700	H. S. Mountain	Sir Laurence's Imogen	Feb. 19, 1929	May 17	47	—	31 4	—	24 8	55 12	4.40	55.75	17.60	.70	74.05	H.C.
1702	William E. Press	Margawse	Aug. 2, 1926	May 23	41	—	25 12	—	23 4	49 0	4.87	49.00	19.48	.10	68.58	H.C.
1703	E. A. Strauss, M.P.	Blush	Jan. 28, 1927	Mar. 1	124	May 21	28 4	—	23 0	51 4	5.40	51.25	21.60	8.40	81.25	Third Prize
1704	E. A. Strauss, M.P.	Kingston Daphne	Mar. 29, 1926	Mar. 19	106	June 4	26 0	—	20 4	46 4	4.32	46.25	17.28	6.60	70.13	H.C.
1705	William A. White	Gloriania	Sept. 3, 1928	May 3	61	—	12 12	—	13 0	25 12	7.75	25.75	31.00	2.10	58.85	H.C.
1706	William A. White	Wellesbourne Irish Maid	May 18, 1926	April 27	67	—	19 12	—	17 12	37 8	4.40	37.50	17.60	2.70	57.80	Insufficient points
1719	Capt. and Mrs. V. Morse	Dora's Fancy	May 7, 1930	May 8	56	—	26 12	—	22 8	49 4	4.30	49.25	17.20	1.60	68.05	H.C.
1721	Mrs. A. E. Phillips	Dalby Christabelle	Sept. 26, 1930	Feb. 21	132	May 8	17 4	—	15 0	32 4	5.00	32.25	20.00	9.20	61.45	H.C.
1727	William A. White	Thorny 4th	Feb. 21, 1930	June 8	25	—	14 4	—	13 4	27 8	5.02	27.50	20.08	Nil	47.58	Insufficient points
Class 211		**Kerry. Thrice Milked.**														
1767	Kerry Cow Dairy Farms	Drumgaunagh Mary	1926	April 3	91	—	12 4	11 4	13 4	36 12	4.28	36.75	17.12	5.00	58.87	H.C.
1768	Kerry Cow Dairy Farms	Drumgaunagh Verina	July 20, 1926	May 13	46	—	20 12	13 4	16 0	50 0	3.73	50.00	14.92	.60	65.52	Third Prize
1770	Newton R. Steel	Gort Tulip	May 21, 1924	May 1	63	—	20 12	15 4	20 4	56 4	3.05	56.25	12.20	2.30	70.75	First Prize
1771	Newton R. Steel	Pallas Victoria	Mar. 8, 1924	April 1	93	—	16 4	14 4	16 8	47 0	3.38	47.00	13.52	5.00	65.52	Second Prize
Class 211		**Kerry. Twice Milked.**														
1769	H. E. Mitchell	Cuckfield Pearl	May 20, 1925	Feb. 4	149	May 9	17 12	—	16 4	34 0	5.30	34.00	21.20	4.00	59.20	Reserve
Class 212		**Dexter. Thrice Milked.**														
1798	Mrs. Ernest Johnson	Astonhayes Woodlawn	Feb. 14, 1931	Mar. 29	96	April 30	11 12	8 8	10 0	30 4	3.30	30.25	13.20	5.60	49.05	Reserve
Class 212		**Dexter. Twice Milked.**														
1788	Lady Loder	Grinstead Convolvulus 4th	Mar. 31, 1930	May 1	63	—	19 4	—	14 0	33 4	3.20	33.25	12.80	2.30	48.35	H.C.
1789	Lady Loder	Grinstead Hawk 5th	June 12, 1928	May 10	54	—	21 0	—	16 4	37 4	3.42	37.25	13.68	1.40	52.33	Second Prize
1790	Rev. E. A. Douglas Morgan	Violet	July 3, 1927	May 12	52	June 9	21 4	—	14 0	35 4	3.65	35.25	14.60	1.20	51.05	Third Prize
1791	Rev. E. A. Douglas Morgan	Wealden Mistletoe 2nd	Dec. 25, 1928	April 2	92	May 22	14 0	—	11 12	25 12	3.07	25.75	12.28	5.20	43.23	H.C.
1795	Mrs. T. H. Peyton	Gaynes Gay	Mar. 14, 1925	May 2	62	—	21 4	—	19 4	40 8	3.30	40.50	13.20	2.20	55.90	First Prize

The premier award among the Lincoln Red Shorthorns went to " Bendish Sunbeam 10th ", with a milk yield of 69½ lb., an average fat percentage of 3·26 and 82·54 total points.

The four South Devons competing put up an excellent performance. " Milkmaid 33rd ", which was awarded the first prize, yielded 82¼ lb. of milk, giving a fat percentage of 3·6. Her total points were 103·25.

" Necton Daffodil " was first among the Red Polls with 73·45 points.

The Blue Albion cow, " Stow Pansy ", qualified for the first prize with 74·55 points.

Twelve British Friesians competed, the premier award going to " Combermere Eleanor 2nd ". This cow, born November 6th, 1928, yielded 92½ lb. of milk, giving an average percentage of fat of 3·72—an excellent performance. The total points awarded to this animal were 107·34.

" Killis Queen Belle " and " Curbridge Flora " were second and third respectively in this Class.

Only three Ayrshires competed, the best performance being that of " Auchenbrain Miss Craig 34th ", with a milk yield of 84¼ lb., a fat percentage of 3·26 and 97·29 total points.

In the Guernsey Class, " May Boy Daisy of the Blanche ", with a milk yield of 70¾ lb., a fat percentage of 3.92 and total points of 86.43, took the premier award.

" March Dinah " was awarded the first prize in the Jersey Class, with a milk yield of 62¾ lb., giving an average of 4·33 per cent. of fat. This cow's total points were 86·43.

Among the Kerries, " Gort Tulip " put up a good performance by yielding 56¼ lb. of milk, and total points of 70·75.

All the Dexters competing qualified, the premier award going to " Gaynes Gay ", with 55·90 points.

TABLE II.—*Average Results obtained in the Milk Yield Classes.*

No. of Cows competing.	Breed.	Yield of Milk.		Fat percentage.	Total Points.
		Lb.	oz.		
8	Shorthorns	62	7	3·17	76·25
7	Lincoln Reds	59	6	3·33	73·86
4	South Devons	70	14	4·04	89·16
7	Red Polls	48	11	3·63	66·72
3	Blue Albions	51	8	3·48	67·60
12	British Friesians	74	5	3·11	86·90
3	Ayrshires	77	9	3·76	93·31
7	Guernseys	53	10	4·07	73·06
18	Jerseys	47	3	4·69	70·13
5	Kerries	44	13	3·85	63·97
6	Dexters	33	11	3·32	49·98

TABLE III.—RESULTS OF BUTTER TESTS AT DERBY, 1933.

CLASS 213.—COWS OF GUERNSEY, JERSEY, KERRY OR DEXTER BREEDS.

No. in Catalogue.	Exhibitor.	Name of Cow.	Date of Birth.	Date of last Calf.	No. of Days in Milk.	Date of last Service.	Milk yield in 24 hours.	Butter Yield.	Ratio, viz. lb. milk to lb. Butter.	No. of Points for Butter.	No. of Points for period of Lactation.	No. of Points for Quality of Butter.	Total No. of Points.	Award and Remarks.
				1933		1933	Lb. oz.	Lb. oz.						
		Guernseys.												
1597	Carl Holmes	Dairy Nellie's Queen	Mar. 16, 1925	April 20	74	June 10	48 4	2 8¾	18 94	40·75	3·40	7·00	51·15	H.C.
1605	Lord Swaythling	Otterbourne Sylvia	Sept. 7, 1928	Mar. 29	96	June 21	62 0	2 12½	22·29	44·50	5·60	8·00	58·10	1st Prize and Reserve for Champion Gold Medal
1616	Mrs. Evelyn Rich	Silverstead Nina	Aug. 10, 1929	Feb. 6	147	April 27	40 0	2 1	19·39	33·00	10·70	4·00	47·70	H.C.
1618	Lord Swaythling	Dorina of the Valinguet	Dec. 8, 1929	May 13	51	—	51 4	1 9	32·80	25·00	1·10	3·00	29·10	Ratio over 30
1619	W. G. Trower	Stanstead Rose 59th	Feb. 14, 1929	May 27	37	—	46 8	1 12½	26·10	28·50	Nil	5·00	33·50	Below standard
		Jerseys.												
1678	Grosvenor Berry	Black Art's Post Girl	Mar. 20, 1928	Mar. 24	101	June 23	52 8	2 4¼	23·17	36·25	5·00	4·00	45·25	Certificate of Merit
1679	Grosvenor Berry	Excess Postage	Mar. 26, 1929	Feb. 10	143	April 18	42 8	2 8½	19·15	35·50	10·30	4·00	49·80	Certificate of Merit
1680	Grosvenor Berry	March Dinah	Mar. 21, 1928	Mar. 21	104	June 19	62 12	2 9	24·49	41·00	6·70	5·00	52·40	5th Prize
1681	Mrs. Evelyn	Wotton Early Minx	Jan. 14, 1928	May 25	39	—	67 12	2 15	23·06	47·00	Nil	8·00	55·00	4th Prize and E.J.C.S. Bronze Medal
1686	Capt. R. S. Hall	Cosy	Mar. 18, 1927	April 18	76	May 29	55 4	2 7	22·66	39·00	3·60	8·00	50·60	Certificate of Merit
1687	Mrs. Henry Hawkins	Jim's Queen of Spades	Mar. 30, 1928	April 26	68	June 18	43 12	1 14	23·33	30·00	2·80	4·00	36·80	Below standard
1690	Capt. E. L. Hughes.	Princess Peggy	Oct. 24, 1928	June 20	13	—	58 8	2 10	22·28	42·00	Nil	5·00	47·00	Certificate of Merit
1697	J. Pierpont Morgan.	Happy Midsummer Dream	June 25, 1924	May 18	46	—	40 4	1 12¼	22·79	28·25	·60	3·00	31·85	Below standard
1698	Capt. & Mrs. V. Morse	Fairseat Demure 2nd	July 14, 1929	May 15	49	—	39 0	1 15¾	19·65	31·75	·90	7·00	39·65	Certificate of Merit
1699	H. S. Mountain	St. Laurel's Berthe	July 26, 1926	Feb. 12	141	May 8	42 0	2 7¼	17·12	39·25	10·10	6·00	55·35	3rd Prize and E.J.C.S. Silver Medal
1700	H. S. Mountain	Sir Laurence's Imogen	Feb. 19, 1929	May 17	47	—	55 12	2 12	20·27	44·00	·70	7·00	51·70	Reserve Number and Certificate of Merit
1702	W. E. Press	Margawse	Aug. 2, 1926	May 28	41	—	49 0	2 8	19·60	40·00	·10	5·00	45·10	Certificate of Merit
1703	E. A. Strauss, M.P.	Blush	Jan. 28, 1927	Mar. 1	124	May 21	51 4	2 11½	18·85	43·50	8·40	6·00	57·90	2nd Prize and E.J.C.S. Gold Medal

TABLE III.—RESULTS OF BUTTER TESTS AT DERBY, 1933 (*continued*).

CLASS 213.—COWS OF GUERNSEY, JERSEY, KERRY OR DEXTER BREEDS.

No. in Catalogue.	Exhibitor.	Name of Cow.	Date of Birth.	Date of last Calf.	No. of Days in Milk.	Date of last Service.	Milk yield in 24 hours.		Butter Yield.		Ratio, viz. lb. milk to lb. Butter.	No. of Points for Butter.	No. of Points for period of Lactation.	No. of Points for Quality of Butter.	Total No. of Points.	Awards and Remarks.
		Jerseys.		1933		1933	Lb.	oz.	Lb.	oz.						
1704	E. A. Strauss, M.P.	Kingstone Daphne . . .	Mar. 29, 1926	Mar. 19	106	June 4	46	4	2	2¼	21·60	34·25	6·60	6·00	46·85	Certificate of Merit
1705	W. A. White . .	Glorania	Sept. 3, 1928	May 8	61	—	25	12	1	14¼	13·61	30·25	2·10	4·00	36·35	Below standard
1706	W. A. White . .	Wellesbourne Irish Maid .	May 18, 1926	April 27	67	—	37	8	1	11¾	21·62	27·75	2·70	3·00	33·45	Below standard
1719	Capt. & Mrs. V. Morse	Dora's Fancy	May 7, 1930	May 8	56	—	49	4	2	5¼	21·15	37·25	1·60	8·00	46·85	Certificate of Merit
1721	Mrs. A. E. Phillips .	Dalby Christabelle . . .	Sept. 26, 1930	Feb. 21	132	May 8	32	4	1	10	19·84	26·00	9·20	5·00	40·12	Certificate of Merit
1722	Hon. Mrs. Tennant	Anemone's Acid Princess .	Jan. 9, 1930	Mar. 29	96	June 25	25	12	1	3¾	20·86	19·75	5·60	4·00	29·35	Below standard
1725	Hon. Mrs. Tennant	Wonderful Novelette . .	July 23, 1930	Jan. 13	171	May 10	21	0	1	8	14·00	24·00	Nil	6·00	30·00	Below standard
1726	Lady Walston . .	Newton Queen 4th . .	April 16, 1930	April 17	77	—	49	12	2	3¾	22·26	35·75	3·70	3·00	42·45	Certificate of Merit
1727	W. A. White . .	Thorny 4th	Feb. 21, 1930	June 8	25	—	27	8	1	7	19·18	23·00	Nil	7·00	30·00	Below standard
		Kerrys.														
1767	Kerry Cow Dairy Farms	Drumgaunagh Mary . .	1926	April 3	91	—	36	12	1	10	22·61	26·00	5·00	6·00	37·00	Below standard
1768	Kerry Cow Dairy Farms	Drumgaunagh Verina . .	July 20, 1926	May 18	46	—	50	0	1	12¾	27·82	28·75	·60	5·00	34·35	Below standard

CLASS 214.—COWS OF ANY OTHER BREED.

No. in Catalogue.	Exhibitor.	Name of Cow.	Date of Birth.	Date of last Calf.	No. of Days in Milk.	Date of last Service.	Milk yield in 24 hours.		Butter Yield.		Ratio, viz. lb. milk to lb. Butter.	No. of Points for Butter.	No. of Points for period of Lactation.	No. of Points for Quality of Butter.	Total No. of Points.	Awards and Remarks.
		Dairy Shorthorn.														
1062	E. U. Gillate . .	Orfold Jessy 2nd . . .	Nov. 29, 1925	April 7	87	June 15	61	4	1	10	37·69	26·00	4·70	4·00	34·70	Ratio over 30
1064	Kidner Bros. . .	Stokeleycross Cherry Blossom 5th	May 2, 1926	May 17	47	—	69	4	1	13¼	37·88	29·25	·70	3·00	32·95	Ratio over 30
		Lincolnshire Red Shorthorn.														
1169	John Evens & Son .	Burton Royal Starlight 13th	April 20, 1927	May 11	53	—	57	12	1	15½	29·33	31·50	1·30	7·00	39·80	H.C.
1174	John Evens & Son .	Burton Amy 14th . . .	June 22, 1926	May 16	48	—	53	8	1	11	31·70	27·00	·80	5·00	32·80	Ratio over 30
1175	John Evens & Son .	Burton Priory Lady 7th .	June 16, 1927	May 28	36	—	61	8	1	13¼	33·64	29·25	Nil	6·00	35·25	Ratio over 30
1178	F. Sainsbury . .	Bendish Poppy 9th . .	Feb. 28, 1925	Mar. 24	111	—	57	12	2	2½	26·78	34·50	5·00	4·00	43·50	H.C.
1181	Russell Wood . .	Bendish Cherry 27th . .	Feb. 21, 1927	June 16	17	—	60	12	2	11	22·60	43·00	Nil	8·00	51·00	Reserve Number
1182	Russell Wood . .	Bendish Sunbeam 10th .	May 16, 1928	June 9	24	—	69	8	2	6	29·26	38·00	Nil	6·00	44·00	H.C.

		South Devon.														
1210	Dartington Hall Ltd.	Milkmaid 33rd	Feb. 10, 1926	Mar. 19	106	June 7	82	4	3	3	25·80	51·00	6·60	9·00	66·60	1st Prize and Champion Gold Medal
1212	Dartington Hall Ltd.	Dartington Welcome 2nd .	1926	May 12	52	June 21	82	4	2	15	28·00	47·00	1·20	6·00	54·20	5th Prize
1213	Dartington Hall Ltd.	Zempson Margaret . . .	Sept. 2, 1926	June 7	26	—	67	8	3	3½	20·97	51·50	Nil	5·00	56·50	3rd Prize
1218	Miss Jervoise Smith	Dittisham Nina 2nd . .	June 9, 1925	May 17	47	—	51	8	2	4	22·88	36·00	·70	9·00	45·70	H.C.
		Red Poll.														
1286	John G. Gray . .	Basildon Royal Rosie 8th .	Oct. 14, 1928	Feb. 19	134	April 19	53	12	1	7¼	36·98	23·25	9·40	3·00	35·65	Ratio over 30
		British Friesian.														
1409	Arthur Barber . .	Limestone Snowdrop . .	Feb. 14, 1925	April 28	66	—	67	8	2	4	30·00	36·00	2·60	6·00	44·60	H.C.
1411	James E. Castle. .	Curbridge Flora . . .	Nov. 1, 1925	June 9	24	—	78	12	2	10¼	29·82	42·25	Nil	8·00	50·25	H.C.
1413	Capt. H. Douglas .	Farley Dame	April 26, 1927	June 19	14	—	62	12	1	11½	36·50	27·50	Nil	3·00	30·50	Ratio over 30
1414	T. R. Ford . . .	Cage Carlatta Susanna .	Feb. 12, 1925	June 11	22	—	61	4	1	13½	33·50	29·25	Nil	3·00	32·25	Ratio over 30
1420	Trustees of Sir A. W. MacRobert, Bt.	Doumeside Molly 3rd . .	May 8, 1926	June 18	15	—	63	0	1	15¾	31·74	31·75	Nil	5·00	36·75	Ratio over 30
1421	Lord Rayleigh . .	Terling Profit 9th . . .	July 2, 1927	May 22	42	—	76	12	2	3¾	34·84	35·75	·20	4·00	39·95	Ratio over 30
1424	Strutt & Parker Farms Ltd.	Lavenham Jess 2nd . .	Aug. 13, 1925	May 23	41	—	78	4	2	1¼	37·65	33·25	·10	3·00	36·35	Ratio over 30
1425	Strutt & Parker Farms Ltd.	Lavenham Seabreeze 4th .	Aug. 12, 1926	June 3	30	—	72	8	2	3	33·14	35·00	Nil	5·00	40·00	Ratio over 30
1427	E. G. Barton . .	Combermere Eleanor 2nd .	Nov. 6, 1928	June 11	22	—	92	8	3	4	28·46	52·00	Nil	3·00	55·00	4th Prize
		Ayrshires.														
1506	Comdr. E. W. Billyard-Leake	Dalgig Lady Maud 3rd .	June 3, 1925	June 12	21	—	71	0	3	4	21·46	52·00	Nil	6·00	58·00	2nd Prize
1527	Lt.-Com. C. G. Vyner	Cowdens Jem 2nd . . .	Aug. 21, 1921	May 3	61	—	77	8	2	9½	29·87	41·50	2·10	5·00	48·60	H.C.

·TABLE IV.—MILK YIELD CLASSES FOR GOATS AT DERBY, 1933.

CLASS 224.—QUALITY.

No. in Catalogue.	Exhibitor.	Name of Goat.	Breed.	Date of Birth.	Date of last Kid.	No. of days in Milk.	Milk Yield.			Percentage of Fat.		Percentage of Solids not Fat.		Points.						Awards and Remarks.
							Morn.	Even.	Total.	Morn.	Even.	Morn.	Even.	Milk.	Fat.	Solids not Fat.	Lactation.	Deduction.	Total.	
							Lb. oz.	Lb. oz.	Lb. oz.											
1800	Miss Mary Burgess	Murrayston Clyde	Toggenburg	Feb. 15, 1929	Mar. 20, 1933	107	5 6	5 0	10 6	3·37	3·51	7·88	7·87	10·37	7·13	3·27	1·1	—	21·87	—
1801	Miss Mary Burgess	Murrayston Clyne	Toggenburg	Mar. 1, 1930	Feb. 12, 1933	143	5 5	5 7	10 12	3·44	3·31	8·10	8·19	10·75	7·25	3·50	1·7	—	23·20	H.C.
1803	Miss Bruce Farrer	Hargrave Saintomer	British Toggenburg	May 18, 1929	Mar. 8, 1933	119	5 12	5 9	11 5	3·22	3·30	8·09	8·14	11·31	7·37	3·67	1·3	—	23·65	H.C.
1805	Miss Bruce Farrer	Murrayston Clyte	Toggenburg	April 1, 1931	Mar. 29, 1933	98	4 1	3 11	7 12	3·11	3·12	7·96	8·06	7·75	4·82	2·48	·9	—	15·95	—
1806	Mrs. Morcom	Cornish Jujube	British Toggenburg	Mar. 7, 1928	Jan. 14, 1932	538	6 6	5 7	11 13	4·40	4·12	8·65	8·87	11·81	10·08	4·13	5·4	—	31·42	H.C.
1808	Miss Cecily Booth	Didgemere Salome	Saanen	Feb. 2, 1931	Feb. 1, 1933	154	6 1	6 0	12 1	2·90	3·10	—	—	—	—	—	1·9	—	—	Disqualified
1811	Miss Cecily Booth	Springfield Lizette	Saanen	Mar. 4, 1928	Mar. 6, 1933	121	6 3	5 4	11 7	3·58	3·30	8·18	8·30	11·43	7·89	3·77	1·3	—	24·39	H.C.
1812	J. R. Egerton	Malpas Meadowsweet	British Saanen	Feb. 18, 1929	Feb. 12, 1933	143	7 13	7 4	15 1	4·55	3·93	7·96	8·07	15·06	12·81	4·83	1·7	—	34·40	Third
1814	J. R. Egerton	Worlington Wavey	British Saanen	Feb. 25, 1929	April 17, 1931	810	7 11	6 8	14 3	3·05	3·04	7·90	7·99	14·18	8·64	4·50	5·4	—	32·72	Fourth Prize, Reserve for Dewar Cup with No. 1862
1817	Miss Mostyn Owen	Mostyn Marigold	British Saanen	Feb. 15, 1928	Mar. 3, 1931	855	8 14	7 10	16 8	3·71	3·93	8·48	8·50	16·50	12·57	5·60	5·4		40·07	First Prize, Dual Purpose Challenge Certificate, Chamberlain Cup, Dewar Cup with No. 1856
1819	Miss K. Parker	Didgemere Joan	Saanen	Mar. 7, 1930	Jan. 24, 1933	162	3 1	3 12	6 13	3·47	4·13	8·51	8·27	6·81	5·22	2·28	2·0	—	16·31	—
1820	Miss K. Parker	Heddon Sarah	British Saanen	Mar. 5, 1928	Mar. 9, 1932	483	4 3	4 8	8 11	4·82	4·68	8·18	8·06	8·68	8·24	2·82	5·4	—	25·14	H.C.
1821	Miss Emily Skidmore	Heddon Selina	British Saanen	Mar. 12, 1931	April 13, 1933	83	5 7	5 2	10 9	4·35	4·75	8·41	8·41	10·56	9·59	3·55	·7	—	27·40	H.C.
1824	Miss Emily Skidmore	Heddon Shoe	British Saanen	April 13, 1930	April 15, 1933	81	7 4	6 11	13 15	4·78	4·22	8·30	8·34	13·93	12·57	4·64	·6	—	31·74	Reserve. Reserve Dual Purpose C. Certificate, Reserve Chamberlain Cup
1829	Mrs. Estyn-Jones	Cornish Planchette	British Alpine	Mar. 10, 1931	April 10, 1933	86	4 8	4 11	9 3	3·83	3·70	8·19	8·40	9·18	6·91	3·05	·7	—	19·84	—
1830	Mrs. Estyn-Jones	Didgemere Dena	British Alpine	Mar. 5, 1928	Mar. 24, 1933	103	5 11	5 11	11 6	3·48	3·12	7·92	8·07	11·37	7·50	5·37	1·0	—	25·24	H.C.
1831	Mrs. Roger Wethered	Boddington Bluebell	British Alpine	April 12, 1931	Mar. 6, 1933	121	5 9	5 6	10 15	3·04	2·90	8·15	8·12	—	—	—	1·3	—	—	Disqualified
1833	Mrs. Roger Wethered	Didgemere Decree	British Alpine	Mar. 9, 1930	Feb. 26, 1933	129	3 15	3 9	7 8	3·22	3·32	8·44	8·34	7·50	4·90	2·51	1·4	—	16·31	—
1834	Mrs. Roger Wethered	Didgemere Deluxe	British Alpine	April 12, 1929	Feb. 22, 1933	133	5 8	5 2	10 10	2·96	2·93	7·91	7·90	—	—	—	1·5	—	—	Disqualified
1835	Miss Alexander	Stockwell Tsarina	British	Jan. 23, 1930	May 2, 1932	429	4 10	4 9	9 3	3·71	4·10	9·29	8·90	9·18	7·17	3·34	5·4	—	25·09	H.C.
1836	Mrs. Browell	Feltham Frisky	Anglo-Nubian-Swiss	Mar. 5, 1931	Feb. 24, 1933	131	7 5	7 4	14 9	5·02	4·84	8·10	8·02	14·56	14·36	4·69	1·5	—	35·11	Second
1837	Mrs. Browell	Proffer of Bashley	Anglo-Nubian-Swiss	Feb. 22, 1930	Feb. 18, 1933	137	4 0	3 15	7 15	3·56	3·80	8·77	8·70	7·93	5·83	2·77	1·6	—	18·13	—
1838	Miss C. Chamberlain	Wavelet of Westons	British	June 21, 1929	Mar. 25, 1933	102	4 13	3 11	8 8	3·42	4·32	8·10	8·38	8·50	6·47	2·79	1·0	—	18·76	—
1840	J. R. Egerton	Malpas Magnolia	British	Feb. 8, 1930	Dec. 22, 1932	195	4 14	4 0	8 14	4·83	5·50	9·18	9·09	8·87	9·10	3·24	2·5	—	23·71	H.C.
1841	Miss K. M. Gresley Hall	Webb Larkspur	British	April 17, 1931	May 2, 1933	64	5 5	5 1	10 6	4·44	4·27	8·88	8·80	10·37	9·04	3·67	·4	—	23·48	H.C.
1843	Mrs. Morcom	Cornish Saccharine	British	Feb. 22, 1931	Feb. 27, 1933	128	7 11	7 9	15 4	3·70	3·15	7·98	8·03	15·25	10·45	4·88	1·4	—	31·98	Fifth
1844	Mrs. Morcom	Cornish Sans Souci	British	Jan. 22, 1930	Feb. 21, 1933	134	6 5	5 12	12 1	3·01	2·80	7·67	7·75	—	—	—	1·5	—	—	Disqualified
1848	Mrs. Roger Wethered	Didgemere Darkie	British	April 15, 1929	April 14, 1933	82	4 13	4 5	9 2	4·32	3·22	8·71	8·68	9·12	6·93	3·17	·7	—	19·92	—
1849	Mrs. Roger Wethered	Didgemere Foxglove	British	Feb. 8, 1931	Mar. 10, 1933	117	6 13	5 14	12 11	3.17	2·82	7·95	7·88	—	—	—	1·2	—	—	Disqualified

TABLE IV.—MILK YIELD CLASSES FOR GOATS AT DERBY, 1933.

CLASS 225.—QUANTITY.

No. in Catalogue.	Exhibitor.	Name of Goat.	Breed.	Date of Birth.	Date of last Kid.	No. of days in Milk.	Milk Yield.			Points.			Awards and Remarks.
							Morn.	Even.	Total.	Milk.	Lacta-tion.	Total.	
							Lb. oz.	Lb. oz.	Lb. oz.				
1803	Miss Bruce Farrer	Hargrave Saintomer	British Toggenburg	May 18, 1929	Mar. 8, 1933	119	5 12	5 9	11 5	11·31	1·3	12·61	—
1805	Miss Bruce Farrer	Murrayston Clyte	Toggenburg	April 1, 1931	Mar. 29, 1933	98	4 1	3 11	7 12	7·75	·9	8·65	—
1806	Mrs. Morcom	Cornish Jujube	British Toggenburg	Mar. 7, 1928	Jan. 14, 1932	538	6 6	5 7	11 13	11·81	5·4	17·21	Third
1807	Mrs. Morcom	Cornish Senna	Toggenburg	Feb. 23, 1930	Mar. 12, 1933	115	3 14	3 15	7 13	7·81	1·2	9·01	—
1808	Miss Cecily Booth	Didgemere Salome	Saanen	Feb. 2, 1931	Feb. 1, 1933	154	6 1	6 0	12 1	12·06	1·9	13·96	H.C.
1811	Miss Cecily Booth	Springfield Lizette	Saanen	Mar. 4, 1928	Mar. 6, 1933	121	6 3	5 4	11 7	11·43	1·3	12·73	—
1812	J. R. Egerton	Malpas Meadowsweet	British Saanen	Feb. 18, 1929	Feb. 12, 1933	143	7 13	7 4	15 1	15·06	1·7	16·76	Fourth
1814	J. R. Egerton	Worlington Wavey	British Saanen	Feb. 25, 1929	April 17, 1931	810	7 11	6 8	14 3	14·18	5·4	19·58	Second
1816	Mrs. Morcom	Cornish Renown	British Saanen	Feb. 2, 1929	Mar. 2, 1933	125	7 11	6 6	14 1	14·06	1·4	15·46	H.C.
1817	Miss Mostyn Owen	Mostyn Marigold	British Saanen	Feb. 15, 1928	Mar. 3, 1931	855	8 14	7 10	16 8	16·50	5·4	21·90	First
1819	Miss K. Parker	Didgemere Joan	Saanen	Mar. 7, 1930	Jan. 24, 1933	162	3 1	3 12	6 13	6·81	2·0	8·81	—
1820	Miss K. Parker	Heddon Sarah	British Saanen	Mar. 5, 1928	Mar. 9, 1932	483	4 3	4 8	8 11	8·68	5·4	14·08	H.C.
1821	Miss E. Skidmore	Heddon Selina	British Saanen	Mar. 12, 1931	April 13, 1933	83	5 7	5 2	10 9	10·56	·7	11·26	—
1824	Miss E. Skidmore	Heddon Shoe	British Saanen	April 13, 1930	April 15, 1933	81	7 4	6 11	13 15	13·93	·6	14·53	H.C.
1831	Mrs. Roger Wethered	Boddington Bluebell	British Alpine	April 12, 1931	Mar. 6, 1933	121	5 9	5 6	10 15	10·93	1·3	12·23	Abbey Cup
1833	Mrs. Roger Wethered	Didgemere Decree	British Alpine	Mar. 9, 1930	Feb. 26, 1933	129	3 15	3 9	7 8	7·50	1·4	8·90	—
1834	Mrs. Roger Wethered	Didgemere Deluxe	British Alpine	April 12, 1929	Feb. 22, 1933	133	5 8	5 2	10 10	10·62	1·5	12·12	—
1835	Miss Alexander	Stockwell Tsarina	British	Jan. 23, 1930	May 2, 1932	429	4 10	4 9	9 3	9·18	5·4	14·58	H.C.
1836	Mrs. Browell	Feltham Frisky	Anglo-Nubian-Swiss	Mar. 5, 1931	Feb. 24, 1933	131	7 5	7 4	14 9	14·56	1·5	16·06	Reserve
1837	Mrs. Browell	Proffer of Bashley	Anglo-Nubian-Swiss	Feb. 22, 1930	Feb. 18, 1933	137	4 0	3 15	7 15	7·93	1·6	9·53	—
1838	Miss C. Chamberlain	Wavelet of Westons	British	June 21, 1929	Mar. 25, 1933	102	4 13	3 11	8 8	8·50	1·0	9·50	—
1840	J. R. Egerton	Malpas Magnolia	British	Feb. 8, 1930	Dec. 22, 1932	195	4 14	4 0	8 14	8·87	2·5	11·37	—
1841	Miss E. M. Gresley Hall	Webb Larkspur	British	April 17, 1931	May 2, 1933	64	5 5	5 1	10 6	10·37	·4	10·77	—
1843	Mrs. Morcom	Cornish Saccharine	British	Feb. 22, 1931	Feb. 27, 1933	128	7 11	7 9	15 4	15·25	1·4	16·65	Fifth
1844	Mrs. Morcom	Cornish Sans Souci	British	Jan. 22, 1930	Feb. 21, 1933	134	6 5	5 12	12 1	12·06	1·5	13·56	H.C.
1848	Mrs. Roger Wethered	Didgemere Darkie	British	April 15, 1929	April 14, 1933	82	4 13	4 5	9 2	9·12	·7	9·82	—
1849	Mrs. Roger Wethered	Didgemere Foxglove	British	Feb. 8, 1931	Mar. 10, 1933	117	6 13	5 14	12 11	12·68	1·2	13·88	H.C.

BUTTER TEST TRIALS.

CLASSES 213 AND 214.

There were 73 entries for the Butter Test Trials, but only 53 actually competed—an increase of five on the previous year's figure.

Owing to the intensive heat experienced on the Tuesday of the Show week, the butter obtained from some of the cows was exceedingly soft and oily.

The Champion Gold Medal offered for the cow obtaining the highest number of points in the Butter Tests was awarded to the South Devon cow, " Milkmaid 33rd ", the Reserve number being the Guernsey cow, " Otterbourne Sylvia ".

TABLE V.—*Average Results of Cows entered in the Butter Tests.*

No. of Cows competing.	Breed.	Days in Milk.	Yield of Milk.		Yield of Butter.		Butter Ratio.	Points.
			Lb.	oz.	Lb.	oz.	lb.	
1	Shorthorns .	87	61	4	1	10	37·69	34·70
7	Lincoln Reds .	42	61	7	2	1	29·65	39·90
4	South Devons .	57	70	14	2	14¼	24·50	55·60
1	Red Polls .	134	53	12	1	7¼	36·98	35·65
9	British Friesians	31	72	58	2	4	32·40	40·63
2	Ayrshires .	41	74	25	2	14½	25·42	53·30
6	Guernseys .	74	52	62	2	4¼	23·09	45·76
21	Jerseys . .	83	43	21	2	2	20·39	42·80
2	Kerries . .	68	43	37	1	11¼	25·35	35·67

WORKING DAIRY.

The arrangements at Derby were on similar lines to those obtaining at Southampton in 1932. The number of entries for the Buttermaking Competitions was 178.

Seven teams entered for the Inter-county Buttermaking Championship, which was won by Cornwall, with Devon second and Gloucestershire third.

The Individual Championship was won by Miss Mabel K. Stratton, of Worcestershire, Miss Sidwell M. Stephens, of Cornwall, being Reserve.

Thanks are due to the Dairy Staff for the loyal assistance they rendered in the carrying out of the work entrusted to them.

R. H. EVANS.

Barclay's Bank Chambers,
Pwllheli.

THE FORESTRY EXHIBIT AT THE DERBY SHOW, 1933.

THE forestry exhibit was somewhat smaller than at Southampton in the previous year, there being 38 entries in the competitive section against 44, and 22 non-competitive entries against 46. In the latter section, however, some of the entries contained a considerable number and variety of individual articles.

Mr. J. H. Benyon showed remarkably fine specimen boards in all four classes, and was awarded all four of the silver medals offered. Yarborough Estates Company also entered in all four classes and were awarded three bronze medals for their exhibits.

In the four classes for gates of different types the Chatsworth Estates Company almost equalled Mr. Benyon's success in the previous classes, gaining three silver and one bronze medal. Mr. Benyon had one silver and one bronze medal.

There were again four classes for fencing of different types. Honours were shared by Mr. Benyon and Chatsworth Estates.

The non-competitive exhibits were of great variety and interest and it was not surprising that the Judge awarded five silver medals. Mr. Benyon showed a fine collection of panels made from home-grown timber as well as a number of beautiful articles of furniture. Messrs. Mould and Bloomer put up a very fine nursery exhibit, and an interesting map and model made to show that it is possible to reconcile the preservation of game with the production of the finest quality of timber. The chief items in the entry of the Chartered Surveyors' Institution were exhibits illustrating the utilization of ash and elm; a general exhibit on the use of coppice wood; specimens of cricket-bat willow of good quality and other specimens showing faults and diseases; and a collection illustrating the use of timber for brushes, bobbins and similar articles. Mr. A. D. C. Le Sueur had a silver medal for callipers designed to measure the quarter-girth of trees up to 25 feet from the ground, the example shown having been in use for several years. The London Midland and Scottish Railway had the fifth of the silver medals for a 12-ton cattle wagon constructed of home-grown timber.

The Chatsworth Estates Company was awarded the Special Silver Gilt medal for the best exhibit in the competitive and non-competitive sections.

There were three demonstrations: one on wattle hurdle making by Associated Welwyn Services; another on the cleaving of oak, by Mr. George Walker; and the third, on the very old and interesting lakeland industry of the making of oak spelk baskets, by Messrs. Wilfred Barker & Son.

REPORT OF THE JUDGES ON THE WOODLANDS, PLANTATIONS AND ESTATE NURSERIES COMPETITION, 1933.

INTRODUCTION.

THE competition this year covered the counties of Lincoln, Nottingham and Derby, an area which contains some of the largest and best-known estates in the country. Of the eight estates which entered either all their woodlands in Class VI or particular plantations in other classes, three were very large and have had a long forestry tradition, and five were smaller estates on which interest in forestry has been either comparatively recent or sporadic. On all the estates visited a keen interest was shown in the competition and many well-managed woods were seen. Considerable damage had been caused by heavy snow storms last winter, but in many cases this has been repaired.

GENERAL OBSERVATIONS.

The woodlands in the counties which were eligible for the competition this year present certain well-marked features which are unusual in other parts of England. In the first place most of the young plantations, as well as the old, have been planted with hardwoods and there is a scarcity of the pure, or nearly pure, young coniferous plantations which are common on the better managed estates in most English counties. No award was made in Class II (*a*) (coniferous plantations from 10 to 20 years old) though usually this class is very keenly contested. The entries in the hardwood and mixed classes, on the other hand, were numerous and it was often difficult to select the most meritorious examples.

Another feature which is characteristic of the area is the predominance of plantations in which a very large number of species have been intimately mixed. These mixtures nearly always contain sycamore, ash, beech, European larch, Scots pine and Norway spruce and frequently oak and elm in addition; and hornbeam, sweet chestnut, Douglas fir and Japanese larch may be used in substitution for other species. At Brocklesby and Chatsworth such mixtures have been traditional for generations and smaller estates have followed the lead of the larger, so that Lincolnshire and Derbyshire provide a wonderful field for the study of their use.

When the heterogeneous mixtures planted at Brocklesby and Chatsworth come to maturity many of the species are found to have been suppressed, and the final result is usually either a pure wood or else a mixture of only two or three species. Which species survive depends on the soil and exposure. In many cases sycamore suppresses everything else and a pure sycamore wood results, often littered with the dead remains of Scots pine, spruce and oak. In others larch takes the lead, but if this is cut when 50 to 60 years old, as is generally desired, the remaining crop of sycamore and other species is often insufficient. In one extreme example, at high elevation, where it is now doubtful whether sycamore was planted, the intrusion of rabbits allowed a full crop of Scots pine to develop with an under-storey of beech.

So this mixture, planted in roughly the same proportions over a wide range of soils and positions, gives rise to a very diverse series of woods which may ultimately be entered for competition, some as hardwoods, some as conifers and some as mixed. The woods are nearly all beautiful to look at, and in their early stages are good for game. But a modern forester would criticize them on several counts, the chief of which are (1) that many species are planted in situations to which they are not adapted ; (2) that the thinnings are less valuable than they might be and are very difficult to select ; (3) that the final crop is determined by the nature of the ground and not by the forester, so that there may be a superabundance of certain species and an insufficient quantity of others. The general impression of the Judges was that the woods are becoming swamped with sycamore, much of which has come by natural regeneration; and though there is a very fair market for large boles of this tree, special industries will have to be developed to use up the thinnings. It is very unlikely that this was the intention of the planters, and it is certain that many of the woods would have been more valuable now if sycamore had been omitted in the original planting.

At Brocklesby itself the system works better than on the numerous small estates where it has been imitated. There are many plantations in which three or four species have taken the lead and have grown evenly enough to give beautiful mixed stands ; and this is probably the reason why Brocklesby has clung to a tradition that other large estates have discarded.

These mixtures have a long tradition behind them. They were recommended by James Brown in the middle of last century and there is evidence at Brocklesby that the practice of planting them has been carried on continuously ever since. In the meantime the practice of the younger school of foresters on most estates has swung over to pure plantations of most conifers and very simple mixtures of broad-leaved trees—a policy which reached its climax during the early years of this century ; the fear of soil deterioration has caused a reaction since then and fashion has swung back again in the direction of mixtures. Such estates as Brocklesby and Chatsworth may thus claim that they have been unaffected by temporary changes of fashion and have clung to a tradition which is reasserting itself.

It is only, however, by a superficial reading of the history of forestry that such a claim can be maintained. For foresters have learnt a great deal in the last fifty years and the reasons which led them to abandon very inclusive mixtures have prevented their ever going back to them. The mixtures which are now advocated are restricted to two, or at most three, species, and each species is expected to justify itself by some particular contribution to the general welfare. Thus in order to prevent the soil deterioration which became apparent under pure larch it is now common practice to mix it with sweet chestnut or to introduce small groups of beech. But no longer are species mixed indiscriminately.

DESCRIPTION BY CLASSES.

Under the terms of the Schedule plantations may be entered in any of the following classes.

Class I. Where hardwoods are intended as the final crop: (*a*) planted from 10 to 25 years; (*b*) over 25 years.

Class II. Where the final crop is intended to be conifers: (*a*) from 10 to 20 years; (*b*) over 20 years.

Class III. Where the final crop is intended to be a mixture of hardwoods and softwoods: (*a*) from 10 to 20 years; (*b*) over 20 years.

Class IV. A class for plantations of rarer conifers.

In Classes I, II and III plantations must be at least four acres in extent, and in Class IV at least one acre.

In Class I (*a*); *Young Hardwoods*, the silver medal was awarded to the Welbeck Estates Co., Ltd., for *Gringley Fox Cover*, a plantation of just over 8 acres of pure ash. The plantation is situated near the bottom of a north slope, 50 to 100 feet above sea level. The soil is mostly a sandy loam on clay carrying a ground flora of bracken; but in places the clay comes to the surface and the ground flora there changes to nettle and dog's mercury. The trees, which are 21 and 22 years old, average about 38 feet in height, and as these are 500 to 600 to the acre there is an ample supply of straight and clean trees to select for a final crop. The only criticism that might be brought against this wood is that ash should not be grown pure but, since bud-moth and canker are so common nowadays, it is important to have a large number of trees from which to select a final crop and in this case the north aspect and the heavy weed growth protect the soil from deterioration.

The bronze medal was awarded to the Earl of Yarborough for *Mere Hill*, Brocklesby, a mixed plantation on thin loam overlying chalk, on level ground. It was originally planted with 50 per cent. larch and 50 per cent. sycamore, ash and beech, but the larch was mostly suppressed and the beech has formed an under-storey under ash and sycamore. The age is 25 years and the average height 35 to 40 feet. This mixture has worked well because the ash has grown as fast as, or slightly faster than, the sycamore and will become a valuable crop, while the larch thinnings have been well sold. The under-storey of beech provides a useful mulch. Many of the trees were pruned when young.

Worsley Plantation at Brocklesby is another creditable mixed wood of 25 years, planted on a level sand as an amenity belt. It contains sycamore, ash, cherry, beech and false acacia, and was originally planted with 50 per cent. larch. There is a belt of Corsican pine and flowering trees on the park side which provide protection and delight. The false acacia has outgrown its use and might advantageously have been removed earlier, but its inclusion was merited by its soil-improving faculty and the value of its wood for stakes.

Burton Wood, belonging to Mr. J. W. E. Sanders, at Gate Burton, is also a mixture, but it is only 11 years old and canopy is not nearly complete. Here too the ash has grown faster than other species and is straight ; and, despite the heavy soil, Scots pine has outgrown the larch, many of which have died.

In CLASS I (*b*) *; Older Hardwoods*, the silver medal was gained by a fine wood called *Belmont Plantation*, in Belton Park, belonging to Lord Brownlow. The plantation, which is 50 acres in extent and 97 years old, runs along the top of a hill and has a slight westward slope ; it contains beautiful timber of oak, ash, sycamore, chestnut and beech, mostly in groups. The quality of the timber may be judged from the record that 10 acres were sold in 1927 for £3,259.

As the wood contributes greatly to the beauty of the park an attempt is being made to regenerate it naturally in groups and thereby to avoid clear filling. This project is assisted by the presence of an under-storey of sycamore, 30 to 50 feet high, in certain sections of the wood ; and where the big trees can be cut without damaging this under-storey too much a sufficient crop will be left on the ground. Groups of young trees are being encouraged by heavy thinning and if rabbits could be excluded there is every likelihood that ash would come up with the sycamore. Otherwise it is likely to become a pure sycamore wood.

Dethick Baulks, at Lea Green, near Matlock, which had been specially cared for by its owner, Mr. J. B. Marsden-Smedley, gained the bronze medal. This too is a mixed plantation, 30 years old, which in the best part has become, through careful thinning, an almost pure oak wood. The coniferous nurses (about 25 per cent.) have been removed and a few ash remain. Some parts of the wood have been spoilt by the swamping effect of sycamore, but, fortunately, this tree has been omitted from a sufficient area to allow a nearly perfect oak plantation to be entered. The oak and ash are about 29 feet high.

This beautiful plantation was established on an area of grass and hawthorn, the soil being a medium clay; the altitude is 500 to 600 feet and the ground slopes slightly to the west. By careful cultivation the conifer nurses were removed as soon as their usefulness was over, so that there was no suppression of the desired species.

The Chatsworth Estates Company entered two pure sycamore woods in this class, both of which have resulted from the suppression of all other trees in mixed plantations. The plantation in *Handley Wood* is 34 years old and 58 feet high, that at *Lees Moor* 33 years old and nearly 60 feet high. The former is much better in quality than the latter and the average quarter girth at breast height is estimated at 7 inches. As so often happens under sycamore, the ground flora is chiefly bluebell.

In two plantations at Brocklesby, which started as similar mixtures, the ascendancy of sycamore is much less pronounced and a better type of wood has resulted. *Irby Dales*, which extends to 30 acres and is 40 years old, is now composed chiefly of ash, elm, sycamore and larch which average about 43 feet in height. The timber is clean and some very good ash and sycamore should result. Between 1917 and 1930 over 12,000 poles have been cut in this wood, realising £1,187 18*s.* 11*d.* In *West Wood on Ermine Street*, which is 27 years old, European larch is being suppressed by sycamore and beech, and most of it has been removed. There is here very little ash and the final crop will be less valuable.

In Class II (*a*); *Plantations of* 10 *to* 20 *years in which the final crop is intended to be conifers*, no award was made, although in most other districts this class would have been very keenly contested. Only three plantations were entered and in two of these the local mixture of hardwoods and conifers had been planted so that their entry in this class was due to the comparative failure of the hardwoods. In later years such woods may come to be good, but while young they are too scraggy for exhibition.

In CLASS II (*b*); *Older Coniferous Plantations*, the silver medal was awarded to the Welbeck Estates Co. for *Haddon Pasture*, a mixture of Corsican pine and European larch, 40 years old and 22 acres in extent. The soil in this wood is deep sand, rich in humus, which favoured the pine rather than the larch, with the result that, though both average about 60 feet in height, the pine is quality I and the larch quality II of the British Yield Tables. In this wood the trees tend to grow in clumps in a manner reminiscent of many natural forests; but the canopy is nearly complete and the stems are remarkably straight, clean and robust.

The bronze medal was won by the Chatsworth Estates Company for *Handley Wood*, which contained an area of 11½ acres of almost pure Scots pine, 27 to 28 years old and about 35 feet high, which is quality I of the Yield Tables. The soil is sand, with a high humus content, on millstone grit. It appears that this plantation started life as a mixture of conifers and hardwoods and that rabbits were largely responsible for the thinning; but the trees are now very clean and straight.

Other notable entries in this class were:—

(i) *Manor Wood* (Welbeck Estates Company), a fine growth of pure Corsican pine 23 years old and about 37 feet high (quality I). The trees were planted at 4 feet, late in April 1910, and the take was remarkably good. The sandy soil is covered with a deep layer of needles and thinning before inspection would have been beneficial.

(ii) *Wilson's Quarter*, Brocklesby Park (the Earl of Yarborough), an area of 10½ acres of European larch, 42 years old and about 56 feet high (II/III quality of the Yield Tables). A sprinkling of hardwoods, mostly ash, remain in the wood.

(iii) *Old Fox Covert, Cottager's Dale*, Brocklesby Park, where European larch, 71 years old, measured about 84 feet in total height (quality II). This is a very nice wood, but has been under-thinned, and the average quarter girth at breast height is only about 9 inches and the taper is very slight. There are a few good Douglas fir and a few sycamore. The soil is sandy loam.

(iv) *Moor Wood*, Lea Green, an interesting wood planted by Mr. J. B. Marsden-Smedley, at an elevation of 800 feet on millstone grit. It is 28 years old and consists principally of a mixture of Scots pine and Corsican pine, the former having an average height of 32 feet and the latter 34 feet. Prior to planting the soil was definitely peaty and was covered with heather, and it appears to suit Scots rather better than Corsican, but both European and Japanese larch were growing well in the vicinity. The plantation was protected by a belt of Austrian pine, but it had suffered severely from damage during the snow-storm last spring.

CLASS III (*a*).—*Where the intention is to have ultimately a mixed wood of Hardwoods and Conifers ;* 10 *to* 20 *years.* It is at this age in mixed woods that the difficulty of management becomes most apparent. Some species grow faster than others and so long as the light-demanders top the shade-bearers no great harm is done. But too frequently species such as beech and sycamore, which cast a heavy shade, outgrow ash, larch and pine and by killing them secure too great a freedom for themselves and become unruly and mis-shapen. It is in the pole stage, represented in this class, that these difficulties first become apparent and the forester has often to be ruthless if he is to preserve a good mixture of conifers and hardwoods.

Long Nursery Rough Ground Plantation at Gate Burton (Mr. J. W. E. Sanders) was considered to be the best plantation entered in this class and was awarded the silver medal. It is growing on a heavy grey clay, is 17 years old and is composed principally of European and Japanese larches, Scots pine, Douglas fir, ash and oak. Such a mixture could never be recommended, but in this case it has been saved by the partial failure of some species in each section and it has become in effect a group mixture which makes it possible to handle. In most places the Scots pine and oak have been suppressed, but there are some nice mixtures of ash and European larch with a little oak, and some patches of sturdy Japanese larch. The thinning has helped in this and the trees have been carefully brushed up.

Barnetby Corner, Hendale, Brocklesby (the Earl of Yarborough), growing on a loam on chalk, is a mixture of Japanese larch, Norway spruce, beech, sycamore and ash, 11 years old. In one part European larch replaces Japanese larch. As would be expected, Japanese larch is running away from everything else (17 feet), and beech, sycamore and ash fill up the gaps. European larch is less active and allows a better mixture to develop. But in both cases the plantation should have been cleaned and pruned before exhibition. This plantation was awarded the bronze medal.

Gare Holt, Intake Plantation, and *Miller's Piece,* at Oxcombe, three plantations made and shown by Sir Francis Bennett, also came into this class. They are all situated on exposed hillsides among the chalk downs and represent man's challenge to adverse climatic and soil conditions. In each case the Brocklesby mixture has been planted, but variations in soil and exposure have split them up into irregular groups where one or other species has emerged triumphant. In this district late spring frosts are very destructive and in the lower parts larch is badly damaged and cankered. It is possible that ash canker is also encouraged by frost.

CLASS III (*b*).—*Where the intention is to have ultimately a mixed wood of Hardwoods and Conifers; over* 20 *years.* The best plantation in this class was *Manor Wood* (Welbeck Estates Co.), an area of 17 acres of mixed European larch, beech and oak, with a little Scots pine, which has been suppressed. The age is 27 years and the taller larch vary from 37 feet to 45 feet in height (quality II of the Yield Tables). The beech is keeping pace beautifully with the larch and the two are about equal in numbers. The oak feels the competition severely and only a few are likely to come through. The trees are clean, straight and free from blemish.

The original mixture in this wood was open to criticism, but in recent years the plantation has been very intelligently thinned so as to maintain a just balance between hardwoods and conifers and to allow room for the healthy and profitable growth of each. The soil, which is sandy, is covered with a beautiful mulch of dead leaves which is decomposing evenly and becoming mixed with the mineral soil. There are no weeds. For this plantation the Judges awarded both the silver medal for the class and the gold medal offered by the Royal English Forestry Society for the best plantation entered in the competition.

North West Corner, Cottager's Dale, Brocklesby (the Earl of Yarborough) earned the bronze medal. This is the usual Brocklesby mixture, but being on sandy soil larch has become dominant in a considerable section and has kept the other trees—sycamore, beech, etc.—under partial control. It is 43 years old. The larch is 50 feet to 55 feet high (quality class III) and it appears that a relatively poor soil has contributed to its success. In parts where sycamore has become dominant other trees are ruined.

East of Lily House, Manby (the Earl of Yarborough) is a younger plantation (21 years), also on sand, in which the larch has grown faster than in Cottager's Dale, but is equalled by Corsican pine, and the two have kept beech and sycamore in check. Where Japanese larch has been planted instead of

European it has swamped everything else. We have now learnt not to mix any species with Japanese larch except Douglas fir, and even this with great caution.

Hendale Old Gorse, Brocklesby, is 35 years old and grows on light loam; the European larch is 53 feet high (quality class II). Ash and sycamore are keeping pace with it and beech is rather slower. The larch has a very small "crown proportion" and is urgently in need of thinning.

In CLASS IV, *Plantations of not less than one acre of one of the rarer Conifers, planted not less than* 5 *years*, there was no entry. This is to be regretted as the desire to have unusual and interesting plantations is a sign of an active-minded silviculturist.

Nor was there any entry in Class V for *Estate Nurseries*, although more than one excellent nursery was seen by the Judges in the course of their inspection. Most estates have reduced their staffs for the sake of economy and they may have felt unable to give the time to bringing their nurseries up to exhibition standard.

CLASS VI *for the best managed woodlands on an estate of not less than* 1,000 *acres* provided some very interesting entries. In comparing estates the Judges are instructed "to take into account examples of systematic management for the production of timber, as well as ornamental planting, planting for sporting purposes, and improvement of residential amenities". Competitors were invited to produce a working plan or some scheme of management.

Despite these instructions it is always difficult to compare the merits of woodlands on a large estate managed by a professional forester with those on small estates where the owner may be creating a forest property and learning his job as he goes.

It is also difficult to compare woodlands which are managed as a business proposition for profit with those which have been cultivated regardless of expense and are treated primarily as an estate amenity. The latter are more likely to obtain awards in the classes which have already been described, as time may be freely spent on making individual plantations as perfect as possible. But when it came to assessing the claims as a management unit of the entire woodland area on an estate the Judges were bound to be influenced by the answer to the question whether it was a property which was so managed as to yield a reasonably high profit to its owner. We should have liked to see profit and loss accounts, which might have confirmed the general opinions we formed in the woods; and even from income and expenditure statements which took no account of the capital built up in, or extracted from, the woods during each year, we could have formed a more reliable opinion about the economic management of the woods. But none of the entrants vouchsafed such information and it is only on very few estates that accounts are kept in such a way that the financial aspects of forestry can be adequately tested. As many woodlands yielded large profits to their owners during the war they have rightly to undergo a period of recuperation before being expected to yield a further profit; but, if woodland valuations are kept up to date, and the change in value from year to year is estimated (it is easier to calculate than most foresters realise), a representative profit-and-loss account can be made out each year without much difficulty.

No estate presented a working plan. But a few of them had prepared brief descriptions or inventories of the woods and sketch plans for management policy. These were very useful both to the Judges and the foresters.

The special Silver Gilt Medal offered in this class was awarded to the Earl of Yarborough for the very fine series of woodlands at Brocklesby and Manby. It is safe to say that no other estate in England can show such a large area of well managed plantations, or such a long continuous record of planting. The woodlands extend to 5,153 acres, which is all high forest, and the nurseries to 13¾ acres. A record has been kept of the number of trees planted in every year since 1787 and only in three years, from 1881 to 1883, does the number fall to zero. Just under twenty-nine million trees have been planted in 147 years, an average of 196,728 a year, and of these nearly twelve millions have been planted during the 54 years during which the present Earl has been owner. This is indeed a monument to the fertile co-operation between the owner and his forester, Mr. Havelock.

Most of the woods have been planted on agricultural land. Numerous broad grass rides, one to two chains wide, have been left which are used for hunting; and as these rides have been arranged with an eye to the contours they are exceptionally beautiful. The owner can drive, as did the Judges, for 19 miles through the woods without covering any ground twice. Variety has been created by clever arrangements of evergreen and deciduous species, and many flowering trees, purple beeches and other striking specimens have been planted on the edges of the woods as well as in the park.

The soil at Brocklesby is mostly loam or sand on chalk, almost free from flint and much more easily worked than the clay which covers the Chilterns. The depth of the loam is very variable, but is nearly everywhere sufficient for first-class tree growth. At Manby the soil is a fairly deep sand. The nature of the soil and the demands of amenity have combined to emphasise hardwoods in the home estate and conifers in the more distant.

As planting has been continuous there is a more regular distribution of age classes than on most estates, perhaps more regular than on any other estate in England. Nevertheless planting, although continuous, has not been equal from year to year. The very careful record which has been kept enables us to visualize the history of the woods over a long period and we find that the most active period was from 1792 to 1823, 31 years during which about 380,000 trees were planted annually. Then there was an abrupt fall, and from 1824 to 1887 (63 years) the average was only 90,000. For the last 45 years, from 1888 to 1933, the average has been raised to about 250,000. If we take the average rotation as 100 years, which for hardwoods is not excessive, there must have been an opportunity for heavy fellings up to the war, during which a large volume of forest capital was rightly realized. But to-day the area of ripe timber is very small and a forester who walks through the woods is impressed with the large amount of immature timber which they carry. Had it not been for the war the ripe timber might have been spread over a longer period so as to bridge the gulf created by the reduced planting programme from 1824 to 1887. No one can question the wisdom of felling extensively during the war when there was a national need and prices were high ; but this makes it necessary to go slowly now, and for some years to come.

The system of planting mixtures, which is practised almost everywhere on the estate, has already been described. It is the weakest point in the woods management and creates a certain dullness in the plantations which diversity in the planting programme would banish. It has bad effects, too, on the timber, since much too high a proportion of the thinnings is rubbish (a great deal is left to rot in the woods) and those species which grow most rapidly are freed from competition too early and become branchy and crooked. It is probable that as the crops reach maturity these defects will become less apparent than in the immature stands which at present abound.

A large part of the interest of the forest management is found outside the woods themselves. The nurseries are a delight, admirably protected by hedges and containing many flowering shrubs and trees as well as thriving forest stock. About a quarter of each is manured each year and sown with potatoes. The sawmill is adequate to the needs of the estate. An Allchin hand-rack bench feeds a 4½-foot saw, with inserted teeth, which is driven by an 8 h.p. Marshall traction engine.

There is an ingenious pulley device which unloads timber and pulls it to the bench. There is a large pressure creosoting plant which was erected in 1895. It has a capacity of 987 cubic feet, is steam-jacketed the whole way round, including the 6-foot doors, and is fed by bogies on iron rails. Careful records have been kept of the work done by the plant and the absorption capacity of each species has been scheduled.

The silver medal in Class VI was awarded to Mr. J. Thornely Taylor, of Scaftworth Hall, Bawtry, near Doncaster. In nearly every respect his estate is a contrast to Brocklesby. It is small, containing only 203 acres of woodland. It is situated on a very poor sea sand, much of it only a few feet above sea level; and most of the woods have been planted by the present owner and his father who, working against almost every handicap, have created forest out of what was little more than a wilderness. This is pioneer work needing not only high courage and perseverance, but ingenuity in experiment and a healthy disregard of neighbours' scepticism.

Of the 203 acres 171 have been planted or replanted in the last 30 years. The remaining 32 acres are hardwoods of indifferent quality, the soil being in most places too dry for the more profitable broad-leaved trees. The principal species now planted are Scots and Corsican pines, European and Japanese larches. Kurile larch was tried, but was destroyed by frost. In the earlier plantations the species were mixed together, but as experience was gained as to their requirements the species were planted pure and the more recent pure plantations of Japanese larch and Corsican pine, generally sheltered by belts of Austrian pine, are first or second quality of the Yield Tables, which for the soils planted is very good indeed. The pines are now planted in the driest areas and those most subject to frost, and larch on the higher ground and on old woodland soil. Brushing and preliminary thinning have been undertaken in all but the most recently planted blocks, but the time has now arrived when much more attention must be devoted to this operation and markets for thinnings must be worked up.

An important economic consideration in the management is that a staff of men has to be employed to maintain the drainage system of the River Idle, which bounds the estate. At certain times of the year this staff can be spared for forestry, which does not, therefore, increase the number of hands which have to be employed. Some of the planted areas are subject to flooding, which adds to the difficulty of cultivation.

There is a small sawmill driven by a 24 h.p. Blackstone oil engine and an unheated creosoting tank; but most of the timber is sent to an up-to-date sawmill on an estate in Yorkshire which is also owned by Mr. Thornely Taylor.

The Bronze Medal was won by Lord Brownlow for his estate at Belton, Lincolnshire. This estate extends to 5,000 acres, of which 370 acres are woodlands. These are scattered about the park and surrounding land, mostly in the form of belts which are admirably arranged for amenity and sporting but are difficult to manage as commercial forestry units. The present owner and agent have, however, introduced a scheme which is interesting chiefly by reason of the special difficulties that it attempts to solve.

The old woods are mostly from 70 to 100 years of age and contain very fine ash, beech and sycamore along with less good oak and sweet chestnut. Some idea of the quality of the stands can be gained from the fact that about 10 acres were sold standing in 1927 for £3,259. But there was an almost complete gap in planting between 1856 and 1921, and treatment now consists either in clear felling and planting or in selection felling as described on page 445 in the description of Belmont Wood. There is little intermediate treatment.

The average area planted each year is about 5 acres, but the owner has wisely decided to fell 15 or 20 acres at a time and replant once in three or four years, and under this system a nursery is not required. While prices are so low felling is almost completely suspended; but a successful plantation of poplar, at 12 feet spacing, has recently been established in Peascliff, and Hanging Wood has a good young crop of ash, beech and larch.

The working plan consists of a map on which has been entered the prescribed treatment for each wood, and two pages of notes on past treatment. This is much more than most estates can show, and though it is scarcely adequate for all the purposes of management, it has great value.

There is an estate sawmill with a Ransome rack-bench which was very cheaply installed. Power is taken from an 8 h.p. Fowler traction engine and a 5-foot saw with inserted teeth is used. There is also a push bench which is operated separately. As the woods contain a large quantity of the less durable timbers which can be used on the estate, a creosoting plant would be of value.

The Chatsworth Estate, managed by the Chatsworth Estates Co., is well known for its forest management. Of a total area of 26,095 acres the woodlands occupy 2,294 acres and are mostly scattered in broad belts on the steep valley-sides characteristic of the Peak District. In the park, which has been very beautifully laid out, they are mostly disposed on the hill tops, giving strength and interest to the sky line. Many of the woods are above the 1,000 feet level. Handley Wood (56 acres) lies on a separate part of the estate and is less hilly. Like most of the other woods, it is growing on a soil decomposed from the millstone grit; but the soil here is of very fine quality and all species grow with exceptional vigour.

Planting on the estate has been very erratic. The period of greatest activity was from 1890 to 1910, during which time more than 30 acres were planted annually. For the next 20 years very little planting was done and, though there has been more in the last few years, the annual setting out of plants is insufficient to keep up the traditions of the estate. The staff must find plenty to do in thinning the large area of immature plantations which are the legacy of the previous planting.

There is a tradition of mixed planting here just as there is at Brocklesby and there are very few areas on which many species of hardwoods and conifers have not been intimately mixed. As has already been pointed out, such mixtures are difficult to thin, but if left untouched they thin themselves more effectively than pure plantations, and generally produce a crop of some value. There are many woods on this estate which illustrate this generalization. The heavy snow-storm at the beginning of this year caused a lot of damage in the plantations and it does not appear that mixtures were less affected than pure woods.

Judges { W. E. HILEY.
A. AUCHTERLONIE.

REPORT OF THE JUDGES ON THE ORCHARDS AND FRUIT PLANTATIONS COMPETITION, 1933.

The R.A.S.E. Orchard and Fruit Plantations Competition for 1933 was restricted to the Counties of Berkshire, Surrey, Sussex and Kent, and attracted 70 entries (2 being withdrawn during judging) from 45 growers. The entries were distributed as follows:—3 from Surrey, 45 from Kent, 5 from Sussex, and 17 from Berkshire. The judging was completed between Monday and Saturday, June 12th to 17th, 1933, the itinerary covering 512 miles. The tour was carefully planned by Mr. E. C. Boughton of the National Farmers' Union, and the progress of the Judges was greatly expedited by the County Officials, who acted as guides, namely, Mr. A. E. Barnes, of Berkshire and Mr. W. G. Kent, of Kent. In view of the small number of entries from East and West Sussex and Surrey, it was not found necessary to call upon the services offered by the County Officials concerned, namely, Mr. A. E. Burgess, Mr. F. W. Costin and Mr. Johnson. Messrs. Kent and Barnes were also very helpful in supplying information concerning the soils on which the plantations were established. Thanks are also due to Mr. Thomas Neame for hospitality on one night, to all competitors for their friendly welcome and for offers of hospitality which could not be accepted owing to shortness of time.

The score-card as previously used was adopted, except that marks under (*e*) as regards top fruit were taken either as "soil management (including manurial control) for arable plantations", or "grass management (including manurial control) for grass plantations". The score-card for Strawberries was also slightly amended, and the cards actually used are appended.

Points were awarded for :—

15	(*a*)	System of planting.
10	(*b*)	Pruning and shape.
20	(*c*)	General vigour and productiveness.
20	(*d*)	Freedom from pests and disease.
10	(*e*)	See above.
10	(*f*)	Selection of varieties.
10	(*g*)	Economic and commercial aspect.
5	(*h*)	General appearance.
100		

In the case of Strawberry entries, points were awarded as follows :—

10	(*a*)	System of planting.
5	(*b*)	Strawing.
15	(*c*)	General vigour and productiveness.
25	(*d*)	Freedom from pests and disease.
15	(*e*)	Cultivation and manurial control.
10	(*f*)	Selection of varieties.
10	(*g*)	Economic and commercial aspect.
10	(*h*)	General appearance.
100		

It is suggested, however, that the score-card for top fruits might with advantage be revised, more particularly in the direction of giving a clearer indication of the underlying principles upon which orchards and plantations are judged. It also seems desirable that competitors should have some guide to the competition by means of an explanation of the score-card. A suggested amended score-card is given opposite.

TOTAL 100 points.	Planning. 40 points.	Site and Layout. 20 points.	Distances of Planting. 10 points.
			Layout in reference to tree protection, windbreaks, headlands and cross-roads, water supply, air drainage, morning sun and storage facilities. 10 points.
		Selection of Varieties. 20 points.	Value for market purpose in view. 10 points.
			Value as Pollinators. 5 points.
			Similarity of management (*e.g.*, effect of sprays). (Marks might be allowed for *complementary* value, *e.g.*, upright filler-pollinator in widespread varieties.) 5 points.
	Management. 60 points.	Pest and Disease Control. 30 points.	Pest and Disease Control. 30 points.
		Tree Control. 30 points.	Shape and pruning in reference to productiveness and management. 10 points.
			Physiological condition of the trees. (This involves all soil and/or grass management and manurial practices.) 20 points.

It is also suggested that very young plantations of top fruit should not be shown in the competition, since the cumulative effect of management does not begin to show for some seasons. Four years is suggested as the youngest age of plantation which might be shown.

Using the old score-card basis, the following awards were made, and notes concerning the winning and reserve entries are appended.

CLASS 1.—Open to growers of 10 acres and over. Best managed plantation or orchard of top fruit planted not less than 8 years, on stems not less than 3 feet, of which not less than 3 acres must be entered. (11 entries.)

First (85 points). A. Day, Headcorn.

This entry was a very pleasing grass orchard of "Bramley's" and "Lord Derby" on an alluvial silt-clay of Wealden origin, and was stated to have been a poor arable field at the time of planting 19 years ago. A good crop was in evidence. The grass was well managed by manuring and sheep, but the orchard as a whole seemed to need additional nitrogenous manuring at the time of inspection.

The pest and disease control was excellent and the spray programme was stated to have been tar-oil winter wash, two pre-blossom scab sprays and two post-blossom wet sprays with two later powderings.

There was a little redundant wood in some trees, but generally they were well pruned and shaped. The success of this orchard is, in our opinion, due to the determined and conscientious application of modern technique. While this orchard was planted at 30 feet × 30 feet (diagonal plant) the closeness of the trees was not especially serious on this particular soil.

Second (80 points). J. D. & A. J. Large, Goudhurst.

A grass orchard of 6 acres consisting of "Bramley's" and "Worcester", mainly planted at 36 feet × 36 feet, and mainly some 18 years of age, on the Tunbridge Wells Sand formation. This orchard is an example of the successful replanting of an old orchard, and obviously a great deal of care and forethought had been expended upon it. There was a fairly good crop, mainly on the higher parts of the trees.

The turf was in good condition, although there was a little too much grass at the time of our visit.

The pest and disease control was good, although the spray programme of tar-oil, followed by lime sulphur wash, had not entirely eliminated disease and pest attack.

The pruning and growth of the trees were very good.

This orchard reflects considerable credit on the owners.

Reserve (77 points). C. R. Favell, Crundalls, Matfield.

A grass orchard of between 6 and 7 acres over the Tunbridge Wells Sandstone formation, containing rather too many varieties—"Bramley's", "Lord Derby", "Lady Sudely", "Worcester", "Beauty of Bath", "Lord Nelson" and "Lane's"—and planted at 30 feet × 30 feet, a distance too close for several of the varieties.

The manuring of the trees through the grass was producing healthy growth, but the crop was heavy on some varieties only.

The pest and disease control was fairly successful and the spray programme was stated to have been tar-oil and lime sulphur wash, followed by copper dusts.

This was a good orchard, but just missed on most points the fairly high standard attained by the class winner.

CLASS 2.—Open to growers of less than 10 acres. Best managed plantation or orchard of top fruit, planted not less than 8 years, on stems not less than 3 feet, of which not less than 1 acre must be entered.

First (75 points). P. S. Clark, Emerald Hill, Wantage.

A grass orchard of 6 acres on a fairly heavy soil associated with the Greensand formation, consisting of standard "Bramley's", "Newton" and "Worcester," planted 25 years. The plant was too close at 24 feet, but this was not too serious on a soil producing only moderate growth.

Sheep were fed in the orchard and the turf was fairly good and well grazed, although a slight yellowness of the trees suggested some nitrogen shortage.

The trees were open and fairly well shaped and the pest control was reasonably successful. The crop, however, was on the light side.

This was the best orchard among a distinctly moderate lot of entries in this class.

Second (65 points). Max C. L. Beale, Nashes, Penshurst.

This entry consisted of nearly 5 acres of apples in grass on an alluvial soil associated with the Wadhurst clay and Tunbridge Wells Sandstone. The orchard was planted some 30 years ago at 24 feet × 27 feet, and the trees have been recently renovated, many having been top-grafted in the last few years. The top-worked trees consisted of "Bramley's", "Laxton's Superb", "Charles Ross" and "Grenadier", while other varieties were "Blenheim", "Worcester", "Lane's", "Lord Derby" and "Newton".

The grass had been skimmed following sheep, and was well managed. The spray programme was stated to have been a comprehensive one, although insect pests were in evidence. In spite of a very light crop, scab control had been persevered with.

The trees were being brought into a profitable condition, although the site may be subject to frost damage. This competitor is tackling a difficult problem with resolution and skill.

Reserve (63 points). Lt.-Col. Normand, Guildford.

This was a small grass orchard, mainly apples, of 1 acre, apparently on a river gravel. The trees were probably not less than 35 years old, and the orchard is in process of renovation. This task has been tackled with courrage and commonsense, although some of the varieties are not strictly commercial. The spray control was reasonably successful.

CLASS 3.—Open to any grower. Best managed plantation or plantations of top fruit planted not less than 8 years, the majority of the stems to be not more than 3 feet, of which not less than 3 acres and not more than 10 acres must be entered.

First (93 points). (Pears.) J. M. Robertson, Hoo, near Rochester.

This was a pear plantation of "Fertility", "Conference" and "Jules", planted 11 years at 12 feet × 12 feet, with a gooseberry interplant, the soil being a deep brick earth. The gooseberries were retained for a special purpose, and were not interfering to any extent with the efficiency of the pears.

The crop was a heavy one, and was the cleanest seen in the competition, due to an efficient and conscientious routine spray programme. This was stated to have been tar-oil winter wash and two pre-blossom sulphur sprays followed by six post-blossom sprays.

The thinning of the crop was adequate for the trade demand which the orchard has to meet.

This orchard is a demonstration of eminently successful production along the lines of the best modern practice.

Second (89 points). (Pears.) T. Neame, Macknade, Faversham.

This pear plantation of 10 acres, on a loam soil associated with alluvial brick-earth, has been planted 21 years at 12 feet × 12 feet. The trees were vigorous in growth (many having been ringed to steady them) and were carrying a good crop of several varieties, the principal being "Conference", "Pitmaston", "Hardy", "Amanlis", "Cadillac", "Clapps" and "Comice". The fruit was being carefully thinned for the rather special trade for which this orchard is designed.

The spray control was excellent. A little difficulty was being experienced in getting the upper parts of the leaders to carry the fruiting spurs without breakage. This was a highly creditable orchard, but presented a few special difficulties not entirely surmounted.

Reserve (85 points). (Apples.) A. A. Corfe, West Peckham.

This apple plantation was some 9 acres in extent, associated with the Hythe Bed formation (over Ragstone) and planted 26 years ago. Half consisted of "Lord Derby" over "Cobs", and the remainder of "Bramley's" planted at 24 feet × 24 feet. The trees are vigorous and are now being thinned to more suitable distances. The pruning and shape of the trees was very good, and the leaves were large and substantial. Pest and disease control was quite good and the trees were carrying a moderate but clean crop, although some insect pests were in evidence. This was an impressive orchard under intelligent and resolute management.

Reserve (85 points). (Pears.) C. W. Finey & Son, Twydall.

A pear plantation of 8 acres apparently on an alluvial soil, the trees being "Fertility" and "Conference" planted at 12 feet × 12 feet. Standard apples were overplanted at 36 feet × 36 feet.

The pear trees were healthy and well shaped. This entry was particularly notable for the excellent scab control, and the trees were carrying a good crop, which, however, seemed to require rather more thinning. It was stated that, until recently, under other management this had been an unprofitable and scab-ridden orchard.

CLASS 4.—Open to any grower. Best managed plantation or plantations of top fruit planted less than 8 years, the majority of the stems to be not more than 3 feet, of which not less than 3 acres and not more than 10 acres must be entered.

First (87 points). R. K. Holdsworth, Belchambers Farm, Kirdford.

The 10 acres entered in the competition was part of a series of adjacent plantations, totalling 58 acres, on Wealden clay, mainly planned to give a permanent plant to "Bramley's" at 30 feet × 30 feet, with a "Cox" in the centre of the square, while filler varieties were planted at 15 feet. The growth was sufficiently good to raise a doubt as to whether the permanent plant is not too close.

There was a good crop of "Early Victoria", and the pest and disease control was good. The pruning and shaping of the trees was very good. This was an impressive entry, the plantation being run on the lines of the best modern technique.

Second (83 points). T. Neame, Macknade, Faversham.

This was an interesting 4 acre plantation, 4 years old, on an alluvial soil, the trees consisting of apples ("Cox", "Worcester", "Ellison" and "Laxton's Superb") on Type 9 stock at 11 feet × 11 feet.

The cultivation and pest and disease control were all good.

The Judges were of the opinion that the absence of pruning to induce a sturdy tree foundation will lead to difficulties, even accepting an intention to make the life of the plantation very short.

Reserve (80 points). J. Day & Sons, Staplehurst.

This entry consisted of 8 acres of young plums (third season) at 14 feet × 14 feet (diagonal), the varieties being "Czar", "Purple Pershore", "Monarch", "Burbank", "Giant Prune", and a few "Blaisdons". The plantation was free from pests and the pruning for the tree foundation was good. We were of the opinion that the sacking which was used to bind the trees to the stakes was not an ideal material for the purpose. Some suckers had not been removed from within the tree guards.

CLASS 5.—Open to growers of Cherries. Best managed orchard or orchards planted not less than 8 years, composed wholly or mainly of cherries, of which not less than 3 acres and not more than 10 acres must be entered.

First (90 points). W. Brice, Higham, Kent.

This was the most attractive cherry orchard shown, and consisted of 5 acres of "Early Amber", "Early Rivers" and "Napoleon", planted at 36 feet × 36 feet, about 35 years ago on an alluvial loam soil. The trees were full of vigour and were carrying a very good crop, although the size of the fruit was not remarkable. The pest control was good, and was stated to be due to the use of a special spraying "mast". The grass was well managed.

Second (87 points). Wakeley Bros., Twydall, Gillingham.

This was a good piece of cherries, of 7 acres, planted on a strong loam 27 years ago, and consisting mainly of "Circassian", "Amber", "Rivers" "Noble", "Florence" and "Frogmore", planted at 30 feet × 30 feet.

The orchard showed good growth, was free from pests, and was carrying a very satisfactory crop of good fruit. The grass was well managed. It was stated that the fruit in this orchard had recently been sold for £635 on the trees.

Reserve (84 points). T. Neame, Macknade, Faversham.

This cherry orchard of some 6 acres was planted about 30 years ago at 30 feet × 30 feet, with plums as an interplant, on a soil considerably thinner than the two winning orchards. The chief varieties were " Amber ", " Roundel " and " Rock-Heart ", and the tree growth was not very vigorous. Pest and disease control was quite good. The plums were being grubbed, but the interplanting has obviously affected the usefulness of the cherries.

CLASS 6.—Open to growers of Gooseberries and Currants. Best managed plantation or plantations planted not less than 3 years, of which not less than 3 acres and not more than 5 acres must be entered.

First (89 points). (Gooseberries.) E. S. Attrell, Chailey, Sussex.

This was a 2 acre plantation of " Leveller " gooseberries commenced in 1928, the youngest bushes being 2 years old. The soil is of Wealden origin, and has been heavily manured with dung, with additional potash dressings. The plant was at 5 feet × 4 feet.

The system of pruning for the production of the largest size ripe gooseberries of this variety is highly specialised, and had been done with skill. An excellent crop of very fine fruit was in evidence, and the entry was marred only by a few perennial weeds (mainly bell-bine) and a few cases of die-back among the bushes. This entry was a very deserving winner in this class.

Second (88 points). (Gooseberries.) James Day, Marden, Kent.

In this entry 4 acres of gooseberries planted at 7 feet × 6 feet, overplanted with top fruit, were shown. The soil was a sandy loam over gravel. The varieties planted were " Lancashire Lad " (for canning) and " White Lion " (for the dessert market). Cultivation and pest control were both good, and a fair crop of clean fruit was in evidence. This was a very nice piece of gooseberries.

Reserve (82 points). (Blackcurrants.) T. Neame, Macknade, Faversham.

This entry consisted of 5 acres of " Baldwin " blackcurrants, planted on alluvium at 5 feet 4 inches × 5 feet 4 inches, 6 years ago. This was the best piece of blackcurrants seen, but failed to be higher in the class owing to an unchecked attack of capsid sufficiently severe to be injuring the fruit in some cases. The bushes contained rather too much old wood, and the plant was a little too close on this soil.

CLASS 7.—Open to growers of Raspberries, Loganberries and Blackberries, planted not less than 2 years, of which not less than 2 acres and not more than 5 acres must be entered.

First (89 points). (Raspberries.) T. Neame, Macknade, Faversham.

Two acres of " Lloyd George " raspberries were shown in this entry, planted in 6-foot rows with adequate gangways across the plantation. The growth on the alluvial soil was very good, while the control of the raspberry beetle appeared to be satisfactory. A heavy and early crop was borne by the canes, which were comparatively free of virus disease. The crop was ripening early and the plants had been watered to nullify the effects of drought. The age of the plantation was 6 to 8 years.

Second (88 points). (Loganberries.) J. Day & Sons, Staplehurst.

Two acres of loganberries in their third season were shown by these competitors. The canes were planted at 7 feet × 7 feet as an interplant to plums, the fruiting wood being trained to upright stakes, while the younger wood was trained up other stakes. A good control of the beetle appeared

TABLE OF POINTS.

Class	No.	Exhibitor	Award	(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	(*g*)	(*h*)	Total
1	5	Alfred Day ...	1st	12	8	16	16	9	10	10	4	85
	9	J. D. & A. Large ...	2nd	12	8	15	14	8	10	9	4	80
	6	C. R. Favell ...	Res.	12	7	15	14	8	9	8	4	77
	7	C. W. Finey & Son		13	7	8	15	10	10	7	4	74
	10	Miss S. Mannington		11	7	11	16	9	10	7	3	74
	2	E. R. Bligh ...		8	9	10	15	7	10	7	3	69
	4	W.O.Chandler &Son		8	8	11	13	8	10	7	4	69
	3	W. J. Bosley ...		8	5	12	10	9	10	8	3	65
	9	H. F. Ash ...		8	5	12	10	8	10	8	3	64
	11	A. J. Miller ...		7	8	15	5	8	10	6	2	61
	8	Mrs.O.L.Honeybull		8	5	10	10	9	9	5	2	58
	13	H. Sinclair Reeves		7	6	12	9	6	7	6	2	55
2	15	P. S. Clark ...	1st	10	8	11	16	9	9	9	3	75
	14	M. C. L. Beale ...	2nd	9	8	9	13	9	8	5	4	65
	16	Lt.-Col. Normand	Res.	7	8	14	13	7	6	4	4	63
	17	Guy Smith ...		9	3	8	8	5	9	4	2	48
	19	C. O. Walter ...		7	3	5	7	3	10	4	2	41
3	29	J. M. Robertson ...	1st	14	9	18	19	10	10	8	5	93
	26	Thomas Neame ...	2nd	14	8	16	17	10	10	10	4	89
	24	C. W. Finey & Son	Res.	13	8	17	17	10	10	7	3	85
	23	A. A. Corfe ...	Res.	12	9	16	15	10	10	9	4	85
	25	Lidiard & Cooper		12	9	15	14	8	9	9	4	80
	20	W. Alexander ...		13	8	10	14	9	9	8	4	75
	27	W. A. Pertwee ...		15	8	17	9	5	10	7	3	74
	42	Miss S. Mannington		11	7	14	16	7	8	8	3	74
	28	H. Sinclair Reeves		11	9	12	8	9	8	6	3	66
	30	T. Skinner & Son		12	9	12	8	7	9	7	2	66
	21	A. G. Batchelor ...		9	6	13	8	9	8	6	3	62
	22	F. Carter		8	7	13	10	7	6	7	3	61
	31	E. A. Strauss, M.P.		12	9	10	7	7	6	7	2	60
4	38	R. J. Holdsworth...	1st	12	9	16	16	9	10	10	5	87
	43	Thomas Neame ...	2nd	14	7	16	14	10	10	8	4	83
	34	J. Day & Sons ...	Res.	11	9	10	20	9	8	9	4	80
	41	Rt.Hon.D.Ll.George		14	8	14	11	10	9	8	4	78
	35	R. & B. Dixon ...		11	9	14	12	8	10	8	4	76
	39	W. S. Hudson ...		12	8	14	13	9	9	7	4	76
	40	Lidiard & Cooper...		13	8	12	14	7	10	8	4	76
	33	W. Brice		12	7	14	12	10	9	7	3	74
	36	J. F. Foat ...		12	7	12	10	9	9	8	3	70
	37	T. Foat		11	7	8	9	9	10	7	3	64
	44	C. W. Thorp ...		10	7	15	10	9	1	2	4	58
5	46	W. Brice	1st	14	8	17	18	10	10	9	4	90
	50	Wakeley Bros. ...	2nd	13	8	16	17	10	10	9	4	87
	49	Thomas Neame ...	Res.	11	8	14	18	10	10	9	4	84
	47	R. & B. Dixon ...		11	8	15	16	9	10	9	4	82
	45	W. J. Bosley ...		13	8	12	14	8	10	9	3	77
	48	Mrs.O.L.Honeybull		11	8	14	14	9	10	7	3	76
6	51	E. S. Attrell ...	1st	14	10	18	16	8	10	9	4	89
	52	James Day ...	2nd	13	8	17	17	10	10	9	4	88
	58	Thomas Neame ...	Res.	13	8	17	12	10	10	8	4	82
	56	Rt.Hon.D.Ll.George		13	7	13	14	6	10	8	3	74
	61	C. W. Thorp ...		11	8	13	12	9	10	7	3	73
	55	J. D. & A. J. Large		13	5	12	14	8	10	8	2	72
	59	W. W. Pertwee ...		11	5	16	10	5	10	7	3	67
	60	E. A. Strauss, M.P.		11	7	10	11	5	9	6	2	61
	54	J. F. Foat ...		10	7	10	6	6	10	6	2	57
	57	F. I. Neame ...		15	7	13	0	5	10	5	1	56
7	64	Thomas Neame ...	1st	13	9	16	18	9	10	10	4	89
	63	J. Day & Sons ...	2nd	13	9	16	17	10	10	9	4	88
	67	W. M. Wallis ...	Res.	14	8	17	16	10	10	8	4	87
	65	C. B. Shepherd & G. H. Kenyon ...		13	8	16	17	9	10	8	4	85
	62	James Day ...		13	9	14	16	8	10	8	3	81
	66	E. A. Strauss, M.P.		14	9	10	11	9	10	8	2	73
8	72	W. S. Hudson ...	1st	10	5	14	18	13	10	9	9	88
	69	Messrs. Drews ...	2nd	9	5	12	18	10	8	10	8	
	71	S. J. Fermor ...	Res.	10	3	10	19	10	10	5	5	72
	68	E. S. Attrell ...		9	1	9	15	10	10	9	7	70
	70	J. B. Fermor ...		10	2	5	20	7	10	2	3	58

to have been attained, while the heavy crop of exceptionally bold fruit seemed likely to materialize.

Reserve (87 points). (Himalaya Giant Blackberries.) Wm. Wallis, Bekesbourne Hill.

This entry of 2 acres of "Himalaya" Giant Blackberries was on brick earth at 7 feet 6 inches × 15 feet. The laterals were strong and relatively short-jointed. Some beetle were found, although spray material was on hand. The cultivation was very good.

An entry closely comparable to the above, but older and part of a much larger piece of Himalaya Giant Blackberries, was shown by Messrs. Shepherd & Kenyon (85 points), and was placed below the preceding entry mainly because of rather less vigour in the laterals and the rather closer plant accompanied by a higher training wire.

Class 8.—Open to all growers of Strawberries. Best managed plantation of strawberries, of which not less than 1 acre and not more than 3 acres must be entered.

First (88 points). W. S. Hudson, Tenterden.

This entry was part of a very impressive piece of 5 acres of "Royal Sovereign" with a few "Paxtons", planted on the Wadhurst clay formation. The plants were very strong and productive, and were well covering the rows at 3 feet apart. The strawing was also well done. A few plants were showing signs of yellow-edge disease. The Judges considered that the fruit-shed used for the fruit was rather too hot.

Second (80 points). Messrs. Drews, Enborne Nurseries, Newbury.

This entry of 2 acres consisted of a fairly vigorous and productive plant of "Royal Sovereign" and "Tardiv d'Leopold". The strawing was well done, but there were patches of Polygonum about the field. A few poor plants were noticed, but the entry as a whole was a creditable one.

Reserve (72 points). S. J. Fermor, Ulcombe.

This entry was mainly remarkable for its health and productiveness in its fifth season, but was naturally handicapped against younger plantations, although it might be assumed to have been in its prime a very fine piece of strawberries. The variety was "Royal Sovereign".

A Table of Points appears on the opposite page.

GENERAL NOTES ON THE COMPETITION.

One of the most important functions of the Orchard and Fruit Plantations Competition of the Royal Agricultural Society in England is that it serves as a measure of progress, since something like ten years elapses before a district is again visited. It is not suggested that the Competition itself can be a potent factor for county-wide progress, since such progress depends upon a realisation of the need and possibility of improvement by individual growers, most of whom are not competitors. The urge towards the general betterment of the standards of production can come from the observation of the results of improved technique in practice, *i.e.* being aware of what other growers have accomplished, and from a readiness to try the recommendations of the research, advisory and technical experts.

Since seeing aids belief, it is a pity that competitors cannot have the privilege which falls to the lot of the Judges, of making a continuous tour of this kind. In many reports of the past, the burden has been one of regret at the low standard of the entries, and it is encouraging to be able to detect in the entries in 1933, a marked advance, particularly in the management of tree fruits other than cherries. It should not be inferred that many competitors have arrived at a standard of production approaching perfection, but in the four classes open to tree fruits (other than cherries) (41 entries), the six entries which scored 85 or over are object lessons of the fact that by a resolute, conscientious and efficient application of modern technique, annual crops of clean fruit are, broadly, attainable. Mr. J. M. Robertson's piece of bush pears, which is awarded the Society's gold medal, is an outstanding example of achievement by these means. Of little less merit was Mr. Alfred Day's 19 year old orchard of "Bramley's" and "Lord Derby", in which a clean, good crop had been obtained by similar methods. Among the younger plantations, Mr. R. J. Holdsworth's 58 acres were in a comparable class. It is interesting, particularly as it is probably not a coincidence, that each of the gentlemen named would, we feel sure, hesitate to call himself a "fruit-grower," but all three have achieved success in other fields. It would seem to us that, having little to forget about fruit-growing, they have personally supervised the application of the best available advice. Too frequently the grower of long experience will not seek advice, or having sought it, will compromise between his own inclinations and the advice tendered. On the other hand, we met competitors new to fruit-growing who have sought the best advice and whose past records suggest achievement, but who have, we think, omitted to remember that the will to achievement cannot be delegated, that is, the best results in fruit-growing are obtained under the personal supervision of the grower.

The Cherry class was disappointing, owing to the small number of entries, but the leading competitors attained a fairly high standard.

All the Blackcurrant entries in Class 4 were disappointing, and possibly growers are still suffering from the depressing financial results of a few seasons ago. The winner showed a very fine piece of "Leveller" gooseberries, and this entry was a worthy representative of the specialist dessert gooseberry production, as practised in the Newick-Chailey district of Sussex.

The class for Berry fruits, other than strawberries, presented a "hot" competition, in which the standard was very creditable.

The Strawberry class attracted few entries, but Mr. Hudson's winning piece was probably as good as any other piece to be found in the area.

SYSTEM OF PLANTING.

As usual, frequent comment was made that planting was too close. Even where, at the time of planting, there is a definite intention to thin when necessary, the natural disinclination to remove a cash crop is frequently too strong for the prudent desire to give the permanent plants due room. We were not favourably impressed with some new plantations, which included under-crops or "fillers", and particularly with the "fillers" we doubted whether their economic life would be sufficiently advanced to make easy the decision to grub when the permanent plant shows signs of requiring the room. A parsimonious use of very valuable land is understandable, but much cheaper land is plantable with fruit, and in such cases we strongly advise using only a permanent plant without either under-crop or "fillers".

We are definitely not in favour of large blocks of one variety, even with "Bramley's", since with the so-called "self-fertile" varieties in the "touch-and-go" season a pollinator is a great advantage.

It is also considered important that varieties planted together should stand similar spray or dust treatment.

PRUNING AND SHAPING.

It is difficult to generalize on pruning practice, but the need for keeping right on top of the job is emphatic, while redundant wood should be removed at frequent intervals.

PESTS AND DISEASES.

We cannot stress too strongly the need for the employment of a carefully considered routine of pest and disease control. In addition it is important to make sure that each application is efficient. It is also vital that no part of a programme should be omitted because "it may not be necessary". Several competitors must be, metaphorically, "kicking themselves" because of the omission of some part of their programme, not because of its effect in this competition, but because of the obvious cash loss resulting. We were impressed with the apparently good results this season from the use of copper dusts for scab control, where they followed pre-blossom and immediate post-blossom wet washes. More research work on the control of Apple Sawfly is obviously necessary, since this is threatening to become the most serious of insect pests on apples.

TREE CONTROL BY CULTIVATION AND MANURING.

A considerable volume of information is now available concerning the maintenance of a proper soil balance, and in a number of cases we were pleased to see that this knowledge is finding its way into practice. We should like to discourage "clean" cultivation for mere tidiness' sake; in one plantation blackcurrant roots had been torn and exposed in the course of unnecessary cleaning operations. If cultivation is not clean and the grower has sound reason for the presence of herbage, he should not, in our opinion, be penalized. We were pleased to note that in a number of grass orchards skimming was practised as an adjunct to grazing.

Judges { JOHN F. GOAMAN.
W. LAWRENCE TAYLOR.

REPORT OF THE COUNCIL TO THE ANNUAL GENERAL MEETING OF GOVERNORS AND MEMBERS OF THE SOCIETY,

HELD AT THE

ROYAL AGRICULTURAL HALL, ISLINGTON, LONDON, N.,
on WEDNESDAY, December 6, 1933, *at* 2.30 *p.m.*

Membership.

1. The Council have to report that the list of Governors and Members has undergone the following changes since the Annual General Meeting on December 7, 1932:—19 new Governors (including 3 transferred from the list of Members under Bye-law 9), and 587 new Members have joined the Society, and 4 Members have been reinstated under Bye-law 14; whilst the deaths of 6 Life Governors, 6 Governors, 82 Life Members, and 187 Members have been reported. 2 Life Governors, 11 Life Members and 28 Members have been struck off the books under Bye-law 12, owing to absence of addresses; 7 Governors and 172 Members under Bye-law 13, for arrears of subscription; 6 Governors, 2 Life Members and 349 Annual Members have resigned.

2. By the death in May of Col. E. Vincent V. Wheeler the Council lost their senior ordinary Member. Col. Wheeler joined

the Society in 1887, and two years later was elected to the Council, on which he represented Worcestershire till his decease. During his tenure of office he served on nearly all the Committees; he had been chairman of the Botanical and Zoological Committee, and of the sub-committee responsible for the arrangements in connexion with the annual competitions for orchards and fruit plantations. This latter branch of the Society's activities owed its inception largely to him, and in it he always took the greatest interest.

3. More recently a vacancy has occurred in the ranks of the Council through the death of Maj.-Gen. Lord Treowen, C.B., C.M.G., who, since 1930, had represented the Division of Monmouthshire. Lord Treowen was much interested in the management of the woodlands of his estates, and was a useful member of the Society's Forestry Committee. He will be remembered, too, as a breeder and exhibitor of stock, particularly the Black Welsh Mountain sheep. Wool from his own flocks was woven by the small weavers in his district into cloth which he took pride in introducing to his friends.

4. Earlier in the year the Society lost another old Member by the passing of Mr. Henry Overman, who represented Norfolk on the Council from 1910 till 1928 when the state of his health compelled him to resign from the Society's governing body. Mr. Overman had been a valued worker on many of the Committees of the Council, especially on the Emergency Committee constituted during the War.

5. Amongst other Governors and Members whose loss by death the Society has to deplore are: Earl Cadogan, the Earl of Chesterfield, K.G., the Earl of Romney, Viscount Barrington, Viscount Burnham, G.C.M.G., Viscount Cowdray, Viscount Grey, K.G., Lord Anslow, C.B., Lord Monk Bretton, Lord Remnant, Lord Seaton, Lord Wavertree, the Right Hon. Laurence Hardy, Sir A. W. M. Bosville Macdonald of the Isles, Bart., Sir J. Herbert Cory, Bart., Sir Gordon Cunard, Bart., Sir George R. L. Hare, Bart., Sir Maurice Levy, Bart., Major Sir R. L. Bagge, D.S.O., Mr. Thomas Barr, Mr. A. H. L. Bohrmann, Mr. T. A. Buttar, Mr. William Scarth Dixon, Mr. A. R. Fish, Brig.-Gen. R. M. Foot, C.B., C.M.G., D.S.O., Mr. Ethelbert Furness, Mr. T. D. Harrison, Mr. H. T. Mills, Mr. Harry B. Napier, Mr. R. R. Rothwell, Mr. Tom Smith (of Dickson's, Chester), Lieut.-Col. H. Wickham and Mr. Samuel R. Whitley.

Numbers on Register.

6. These and other changes bring the total number of Governors and Members on the Register to 9,527, divided as follows:—

140	Life Governors ;
217	Annual Governors ;
1,712	Life Members ;
7,445	Annual Members ;
13	Honorary Members ;

9,527 Total number of Governors and Members, as against a total of 9,778 on the Register at the time of the last Annual Report.

Presidency.

7. The Council have decided to recommend to the Annual Meeting the election of the Earl of Stradbroke, K.C.M.G., as President of the Society to hold office until the Annual Meeting in 1934.

Changes in the Council.

8. Mr. John Bell, who for different periods served on the Council for the Divisions of Nottinghamshire and the North Riding of Yorkshire, was last December re-elected to the Council as one of the representatives of the Division of London, to fill a vacancy caused by the death of Mr. H. Dent Brocklehurst.

9. At the end of last year, Mr. A. C. Nicholson was elected a "Nominated Member" of Council to represent the interests of agricultural machinery manufacturers.

Elections to the Council.

10. Members of Council retiring under the scheme of rotation at the forthcoming Annual Meeting are those representing the electoral districts of Group C—comprising Berkshire, Cambridgeshire, Cumberland, Glamorgan, Gloucestershire, Huntingdonshire, Kent, Lincolnshire, Oxfordshire, Somerset, Sussex, Warwickshire, Westmorland, Yorkshire (East Riding), Ireland and North Wales. Governors and Members registered in these districts have been communicated with, and the prescribed procedure is being followed for the election or re-election of representatives for the divisions concerned.

11. Elections are also taking place in Worcestershire (to fill a vacancy caused by the death of Col. Wheeler), and in the electoral districts of Derbyshire, Norfolk and Suffolk, each of which, by virtue of increased membership, is entitled to an additional representative on the Council.

Council Meetings in 1934.

12. The Council have fixed the following dates for their meetings in 1934: February 7, March 7, March 28, May 2, May 30, July 4 (in Ipswich showyard), August 1, November 7, December 12 (Smithfield Show week).

Accounts.

13. In compliance with the bye-laws, the Council beg formally to submit the balance-sheet, with receipts and payments for the year 1932. These accounts were published in Vol. 93 of the Journal issued to Governors and Members this year, having been certified as correct by the Professional Accountants and Auditors appointed by the Members.

Copies of these accounts, and also the statement of Receipts and Expenditure of the Show at Derby, will be available for reference at the meeting on December 6.

The Journal.

14. It has been decided to amalgamate in one volume the *Journal* and *The Farmer's Guide to Agricultural Research.* The last-named for the past seven years has been published in December under the auspices of the Research Committee.

15. The first number of the combined volume will be ready for despatch to Governors and Members at the end of January 1934.

New Edition of Text Book.

16. Early in the current year the new and revised edition of the Society's Text Book, *Elements of Agriculture,* was published.

17. The twelfth edition (ninetieth thousand) has been edited by Prof. Sir Rowland Biffen, F.R.S., and the staff of the School of Agriculture at Cambridge. Each writer has attempted to expound his section in the form of a readable story, giving references to more advanced books from which the reader can fill in the detail of any parts of the work in which he wishes to specialize.

18. The book can be obtained from the Society's offices at 16 Bedford Square, London, W.C.1, or from the publisher, Mr. John Murray, at 50a Albemarle Street, London, W.1, price 10*s.* 6*d.*

Derby Show.

19. Under the Presidency of His Grace the Duke of Devonshire, the 92nd Annual Country Meeting was held at Derby from July 4th to 8th. It was the fifth Show of the Society to take place in this important Midland centre, and, although the 1933 Show created no new records, it was a success in every way. The usual cordial invitation had been extended by the Borough of Derby, and the Local Committee with the Duke of Devonshire at the head, ably assisted by the Mayor of Derby and influential residents in various parts of Derbyshire and the adjoining Counties, were successful in raising a very substantial amount for the Local Fund.

20. The site of the showyard was at Osmaston and had

been used for the same purpose on two previous occasions. It was placed at the disposal of the Society by the kind offices of the London, Midland and Scottish Railway Company, the Corporation of Derby, and the National Playing Fields Association, all of whom had interests in the land.

21. Although the site had been used on two previous occasions for the Royal Show, it was necessary to expend a considerable amount of money in levelling, draining, and preparing it for the Show, and laying on the usual services of gas, water and electricity.

22. An excellent Implement entry was obtained, and in the Stock section a very large classification, embracing most breeds in the country, secured entries which for quality have not been surpassed.

23. *Commercial Pig Classes.*—As mentioned in last year's Report, special classes for Pork and Bacon Pigs were, for the first time, included in the Schedule for the Derby Show. The four classes obtained 55 entries, 27 in the Bacon Pig Classes and 28 in the Porker Classes.

Much interest was evinced in this particular section, the innovation certainly justifying its inclusion. The Judge not only made his awards on the basis of his knowledge of what was required by the " trade " as types of Bacon and Pork Pigs, but gave to the onlookers the reasons for his decisions and the points to be aimed at in producing the ideal pig.

A number of the pigs in both sections were sold to a factory for slaughter and the Report of the Judge on the carcases is awaited with much interest.

24. The exhibits were delivered to the showyard by road and rail, and the L.M.S. Railway utilised the special Show Dock, which was constructed in the year 1921 when the Show was last held at Derby. It adjoined the showyard and provided excellent facilities for the arrival and despatch of exhibits.

25. The Chief Constable of Derby arranged for the policing of the showyard by the Local Constabulary and the Ambulance Services were again undertaken by the St. John Ambulance Brigade.

26. The Midland Division of the Young Men's Christian Association also undertook the welfare work for herdsmen and stockmen in the showyard on the usual lines and, in conjunction with the British Herdsmen's Club, organized Sports, etc.

27. H.M. Life Guards provided the music and the troop for the Musical Ride and Trick Riding Display.

28. Judging commenced on Tuesday, the first day of the Show, and was carried through with promptitude and despatch, and, on the concluding day of the Show, a Hunting

Pageant was given in the Large Ring by children of the Meynell Hunt Pony Club, portraying a day's fox hunting one hundred years ago.

29. The weather during the whole of the Show, with the exception of about an hour on the Friday, was hot, although perhaps not quite so hot as when the Show was last held at Derby in 1921.

30. Their Majesties The King and Queen, who were the guests of the President at Chatsworth, honoured the Show with a visit on Wednesday, and evinced much interest in all portions of the Exhibition. They arrived by motor car from Chatsworth and entered the Royal carriage at Derwent Park, proceeding thence to the showyard. Lunch was taken in the Royal Pavilion, and afterwards Their Majesties saw the Cattle Parade, certain events in the Large Ring, the Flower Show, the Rural Industries Bureau, the Model Allotment Garden for Unemployed men, and, at the conclusion of the tour, went round one of the most interesting features in the Miscellaneous section of the showyard, the special exhibit organized by the Derby and Derbyshire Chamber of Commerce. This represented most of the industries carried on in the county. It was exceedingly well arranged and organized by the Chairman and Secretary of the Chamber.

31. Another interesting exhibit was that of the Midland Colliery Owners' Association, illustrating the use of coal for all purposes. This Association also organized a unique and wonderful display of Pit Ponies, which paraded each day in the Large Ring in charge of the boys who look after them daily at the pits.

32. The attendance figures registered at the turnstiles for the whole Show were 96,350.

Overseas Visitors.

33. In last year's Report on the Southampton Show mention was made of the new departure of the Society in deciding to appoint special Stewards, and to provide a recognized organization for the Reception of Overseas Visitors.

34. Sir Archibald Weigall and Colonel Stanyforth again consented to act as Stewards at the Derby Show, and a Reception Room was opened adjoining the Royal Pavilion.

35. It is difficult, in the absence of direct communication, to find out what visitors from Overseas interested in Agriculture are likely to be in this country at the time of the Show and it would prove of assistance if individual members would communicate to the Secretary in good time the names of visitors who might be invited so that invitations in the names of the President and the Council could be sent.

36. There is always an official in attendance at the Reception Room to welcome them and to help in any way possible.

37. This year at Derby the visitors included several Indian Princes, Cabinet Ministers from the Dominions, Colonial Farmers interested in Pedigree Stock and delegates from the World Economic Conference. The latter were received by the President who entertained them to luncheon on behalf of the Society. After luncheon special parades of the Champion Cattle and Heavy Horses and an inspection of the Implement Section were arranged.

38. The Society also entertained a party of South African farmers touring the country under the auspices of the British National Union and a number of Danish farmers interested in commercial Pig Breeding were received on the last day of the Show. All those who visited the Show were evidently impressed by its size and mobility, and said that many of their friends would be only too glad to visit the Show if economic conditions permitted.

39. Many expressions of gratitude were received for the attention afforded the visitors as well as letters of regret from those who were unable on this occasion to accept the invitation of the President and Council.

Young Farmers' Cattle Judging.

40. Again facilities were provided in the showyard for the holding of the annual international cattle judging contest organized by the National Federation of Young Farmers' Clubs. England, Northern Ireland and Wales were on this occasion represented, and, after a keen contest, the English team secured the Gold Challenge Cup by a narrow margin of ten points over the team from Northern Ireland.

"New Implement" Awards.

41. Five Silver Medals were awarded at the Derby Show, as follows:—

Dunlop Rubber Co. Ltd.	Pneumatic Land Wheel Equipment.
A. C. Bamlett Ltd.	Potato Planter.
John Wilder	Grass Elevator.
Blackstone & Co. Ltd.	Potato Digger.
W. L. Holland	Vegetable Shredder.

42. On the recommendation of the Judges, the trials of the Drill entered by Messrs. Ransomes, Sims and Jefferies, Ltd., and of the Auto-Recording Milk Plant, entered by Messrs. Gascoigne (Reading) Ltd. were deferred until next year.

Woodlands, Plantations and Estate Nurseries.

43. Forty-two entries (38 plantations and four Woodland estates) were received in this year's competition, which was

restricted to Derbyshire, Nottinghamshire and Lincolnshire. No entries were made in the class for Estate Nurseries. The Welbeck Estates Company was awarded the Royal English Forestry Society's Gold Medal for the best plantation, and in the class for the best managed woodlands on an estate of not less than a thousand acres, the First Prize (Silver Gilt medal) was won by the Earl of Yarborough.

44. The area of the competition in 1934 will be the counties of Brecon, Carmarthen, Cardigan, Glamorgan, Pembroke and Radnor.

Orchards and Fruit Plantations.

45. Kent, Surrey, Sussex and Berkshire formed the area for this year's competition, which had 72 entries in eight classes. The Society's special medal for the entry receiving the highest number of points in the competition was gained by Mr. J. M. Robertson, of Beluncle, Hoo, Rochester.

46. Next year's competition will be restricted to the East Riding of Yorkshire, Lincolnshire, Norfolk and the Isle of Ely.

Wisley Fruit Trials.

47. In the interests of Fruit-Grower Members of the Society, a donation of £50 was made by the Council to a special fund raised for the purpose of continuing the trials at Wisley of new varieties of hardy fruits, formerly carried on by the Royal Horticultural Society in conjunction with the Ministry of Agriculture.

Ipswich Show, 1934.

48. Keen interest has been aroused throughout the whole of East Anglia in the project to hold the ninety-third Royal Show at Ipswich next year from Tuesday, July 3, to Saturday, July 7. The County Agricultural Associations of Suffolk, Norfolk and Essex have decided to withhold their annual shows in view of the visit of the National Society, and their members will receive Show privileges.

49. Already the local fund has received most encouraging support, and there is every prospect of an excellent exhibition, particularly of the breeds more especially identified with the area.

Prize-List.

50. With certain alterations, the Prize List for the 1934 Show will be similar to that for the Derby Show. Offers of Champion and other prizes have been received from the following :—Shire Horse Society, Clydesdale Horse Society, Suffolk Horse Society, British Percheron Horse Society, Hunters' Improvement and National Light Horse Breeding Society, National Pony Society, Arab Horse Society, Shorthorn Society, Hereford

Herd Book Society, Devon Cattle Breeders' Society, Sussex Herd Book Society, Sussex Cattle Breeders' Society of South Africa, Welsh Black Cattle Society, Longhorn Cattle Society, Park Cattle Society, Aberdeen-Angus Cattle Society, English Aberdeen-Angus Cattle Association, Dun and Belted Galloway Cattle Breeders' Association, Galloway Cattle Society, Dairy Shorthorn Association, Lincolnshire Red Shorthorn Association, South Devon Herd Book Society, Red Poll Cattle Society, Blue Albion Cattle Society, British Friesian Cattle Society, Ayrshire Cattle Herd Book Society, English Guernsey Cattle Society, English Jersey Cattle Society, British Kerry Cattle Society, Dexter Cattle Society, British Goat Society, Oxford Down Sheep Breeders' Association, Shropshire Sheep Breeders' Association, Southdown Sheep Society, Hampshire Down Sheep Breeders' Association, Suffolk Sheep Society, Dorset Down Sheep Breeders' Association, Dorset Horn Sheep Breeders' Association, Wiltshire Horn Sheep Society, Ryeland Flock Book Society, Kerry Hill (Wales) Flock Book Society, Clun Forest Sheep Breeders' Association, Lincoln Longwool Sheep Breeders' Association, Leicester Sheep Breeders' Association, Society of Border Leicester Sheep Breeders, Wensleydale Longwool Sheep Breeders' Association, Kent or Romney Marsh Sheep Breeders' Association, Welsh Mountain Sheep Flock Book Society, Black Welsh Mountain Sheep Breeders' Association, National Pig Breeders' Association, Large Black Pig Society, Gloucestershire Old Spots Pig Society, Cumberland Pig Breeders' Association, Essex Pig Society, National Long White Lop-eared Pig Society, National Welsh Pig Society.

Owing to the success of the Bacon Pig and Porker Classes at Derby Show it has been decided again to provide Classes and Prizes at the Ipswich Show with one innovation, and that is that the pigs are to be slaughtered at the close of the Show. In addition to the class prizes two Champion Prizes of £25 each are offered (1) for the best live Bacon Pigs, (2) for the best Carcases.

Special Prizes are being offered in the Poultry section by the Croad Langshan Club, Sussex Poultry Club, Columbian Wyandotte Club, Buff Orpington Club, British Barnevelder Club, British Black Barnevelder Club, Welsummer Club, Rhode Island Red Club, Plymouth Rock Society.

Closing of Entries.

51. Intending exhibitors at Ipswich are reminded that the final date for receiving entries of Live Stock is MAY 10. Entries for Produce close on MAY 19, and entries for Poultry and Butter-making Competitions on MAY 31.

Applications for space in the Implement, etc., Department must be made not later than March 20.

Egg Laying Trial.

52. As a result of a proposal made by Sir Guy Hambling, the Poultry section at the Ipswich Show will have an added interest. Nearly an acre of the showyard site has been set apart for a Single Bird Pen Laying Test for utility poultry, including Rhode Island Reds, White Wyandottes, Light Sussex, "Any other variety" Table breed, White Leghorns, Black Leghorns, and "Any other light breed". Accommodation has been provided for 126 birds. The trial began in the middle of October. A gold medal will be awarded to the owner of the bird with the best performance at the end of 48 weeks. There will also be silver and bronze medals awarded for the first and second birds in every section.

53. Next July the public visiting the Royal Show will have an opportunity of inspecting the birds taking part in the trial and comparing their records up to that time.

Medals and Certificates for Long Service.

54. Claims on behalf of farm servants for consideration in connection with the medals and certificates offered by the Society for Long Service must be made through County Agricultural Societies by the end of May. The period of service qualifying for a medal is 40 years on the same or different holdings with one employer, or 40 years on the same holding with different employers. Farm workers, male or female (excluding gardeners, grooms and gamekeepers), in any part of England or Wales are eligible for the awards.

55. The following received medals and certificates this year.

George Insall, Droitwich . .	59 years' service.
Charles Sillence, Romsey . .	56 " "
John Ion, Calthwaite . . .	52 " "
J. G. Robinson, Denton . .	52 " "
Hy. Walters, Slough . . .	46 " "
A. Jones, Hackleton . . .	41 " "

Newcastle Show, 1935.

56. In 1935 the Society will, for the sixth time, take the annual show to Newcastle-upon-Tyne. The northern city's spacious Town Moor, which will be recalled by many as the scene of former successful exhibitions, will again provide the showground.

57. The Highland and Agricultural Society of Scotland have decided to hold their Show of 1935 in Aberdeen, so that there may be no conflict of interests between the two national agricultural fixtures.

Show of 1936.

58. Negotiations are still in progress with the object of securing a site for the show of 1936 at Bristol.

British Judge at Argentine Show.

59. Mr. Sylvester Campbell was appointed by the Council to judge the exhibits of Shorthorn cattle at this year's Palermo show of the Argentine Rural Society.

A letter has since been received from the Rural Society expressing their appreciative thanks and stating that Mr. Campbell's decisions in the judging ring were received with general satisfaction.

Argentine Trade Mission.

60. The members of the Argentine Trade Mission, headed by Dr. Roca, Vice-President of the Republic, who visited this country early in the year, were entertained to luncheon by the Council.

Chemical Department.

61. The slight increase recorded last year in the samples submitted by Members for analysis has hardly been maintained, the number now being 102 as against 136 in 1932.

62. With the exception of Sulphate of Ammonia and certain fertilizers dependent upon its market position, the prices of Fertilizers and Feeding Stuffs generally have undergone but little change during the year, and continue to be in favour of purchasers.

63. Along with this, a steady improvement—largely owing to the Fertilizers and Feeding Stuffs Act—has gone on in regard to the quality of articles supplied. Even the difficulties connected with the presence of Castor-oil bean in feeding-stuffs, to which special attention was drawn last year, seem to have largely disappeared, while there has been a general improvement in the quality of Wheat offals and of Barley meal. The additional regulations attached in September 1932 to the above Act have been found beneficial, and the Act has, all round, worked very smoothly.

64. It has not been found necessary, because of any marked alteration in prices, to recommend any change in the Tables of Unexhausted Manure Values issued by the Central Association of Agricultural Valuers.

Botanical Department.

65. The services of the Botanical Department in 1933 have been in less demand than at any time during the past 20 years. The output of answers to enquiries was about normal until the end of June. These, as usual, were concerned mostly with the failure of autumn sown crops, the germination of seed required for spring sowing and with advice on the choice of cereals. From June onwards most of the enquiries are usually prompted by outbreaks of fungoid diseases and the prevalence of weeds.

This year the crops, as a whole, were exceptionally free from the troubles due to the incidence of parasitic fungi. Most of the common pests could be found when searched for, but, with the exception of the mildews, they failed to establish themselves with the result that no examples were received of some species which are often represented by a dozen specimens during the season.

The weed flora was easily dealt with by cultivation and most of the few specimens sent in were curious abnormalities. With the approach of autumn sowing samples of wheat and oats began to come in but again the number was below that of previous seasons.

Zoological Department.

66. The work of the Department has as usual consisted chiefly in giving advice with regard to the treatment of insect pests of crops, and of animal parasites. Though many injurious insects—especially those of the *Aphis* tribe—were unusually abundant during the summer months, enquiries with regard to them were comparatively few. Probably where drought was the obvious cause of the failure of a crop the pressure of contributory causes, such as insect pests, attracted little attention.

Numerous insects and arachnid specimens, suspected of being injurious, or interesting in other respects, were sent for identification. Most of these occurred in stored food materials.

Veterinary.

67. During the current year Members of the Royal Agricultural Society of England have, on numerous occasions, consulted the Professors of the Royal Veterinary College on subjects such as sterility, mastitis, contagious abortion and parasitic diseases of all varieties in farm stock.

68. In one instance a number of calves in a valuable herd were the victims of a contagious septic pneumonia, whilst in another herd a peculiar wasting affection of the muscles of the backs of some young bulls caused the owner a considerable amount of anxiety. A case of death in a heifer was definitely traced to be due to lead poisoning, a chemical analysis of the viscera demonstrating this to be the cause.

Animal Diseases.

69. Returns for the first three-quarters of the year disclose a less satisfactory state of affairs than that existing twelve months ago. Outbreaks of Anthrax and Swine Fever are fewer than for the corresponding period of 1932, but the figures show increases regarding Parasitic Mange, Sheep Scab and Foot and Mouth Disease.

70. At the close of last year Foot and Mouth Disease existed in six counties of England. In the first fortnight of 1933 twenty outbreaks were confirmed in a dozen southern and midland counties, and there were indications that animals from infected centres had been distributed over a wide area. In the circumstances, the Ministry of Agriculture, on January 11, imposed a Standstill Order covering practically the whole of the Midlands and Southern England. It subsequently transpired that a number of the animals concerned in the outbreaks had picked up the infection at the railway loading docks at Reading about January 6. For the first quarter of the year there were in all 54 outbreaks. There were none in April, but in the latter part of May there was an outbreak in Wilts. June and July were clear of outbreaks, but on August 9 some pigs in Leicester Cattle Market pig lairs were found to be infected. There were other outbreaks during the month in Hants. and Norfolk. In the first half of September more outbreaks were confirmed in the neighbourhood of Basingstoke. There were 65 outbreaks, with 6,123 animals slaughtered as diseased or exposed to infection in the nine months. In 1932 the corresponding figures were 10 and 950.

During October there were further outbreaks in Hertfordshire, Cambridgeshire, Isle of Ely, Lincolnshire, Somerset, and Derbyshire.

71. The increase in the outbreaks of Sheep Scab has been the subject of correspondence between the Society and the Ministry of Agriculture. Following is the substance of a letter received from the Ministry :—

> "The incidence of sheep scab during the first quarter of the current year is closely connected with that for the final quarter of 1932. The rise in the number of outbreaks this year is accounted for by the cases in Cumberland, Yorks N.R., Durham, Lancashire, Anglesey, Renfrewshire and Stirlingshire. Of these counties Cumberland, where there were 34 outbreaks or 26 per cent. of the total number in England, is mainly responsible for the increase. In this county the spread of the disease is due to infection existing on the open fells and special efforts have been and are being made by the Local Authority to deal with this by action under Article 14 of the Sheep Scab Order of 1928. In the North Riding of Yorkshire, where 20 outbreaks have occurred, disease has been disseminated mainly through transactions of dealers.
>
> "On the mainland of Scotland there were 14 outbreaks, 5 of which were traced to infection imported with a consignment of sheep from the North Riding of Yorkshire in Septem-

ber, 1932, and the remaining cases to the spread of infection from one farm in Stirlingshire.

"The difficulties in preventing the survival and spread of Sheep Scab, particularly on mountain pastures and other unfenced land, have been dealt with specially in the Ministry's Annual Reports of Proceedings under the Diseases of Animals Acts for the years 1929 (pages 32–35) and 1931 (pages 39–40) for the guidance of the industry and of Local Authority officials. One of the most important aspects of the problem is the provision of proper dipping facilities and efficient methods of dipping and attention is continuously being directed to this matter by the Ministry's staff. The recent installation in some districts of better dipping baths constructed on the lines indicated in the Ministry's Advisory Leaflet No. 64 has produced a marked improvement in the reduction of the disease and it is hoped that this example will be more widely followed.

"It is the practice of the Ministry to allocate a number of its Inspectors to co-operate with the officials of the Local Authorities in supervising the extensive dipping operations in the late summer months in certain areas and this course is being followed at the present time in Cumberland, the Peak District, Wales, Stirlingshire and the Outer Islands of the Hebrides.

"It is only by the active co-operation of farmers and of others concerned in giving effect to the Sheep Scab Orders that success can be achieved in the eradication of this disease and a special appeal for such co-operation was made by the Minister in his speech on the 11th July in the House of Commons in Committee of Supply."

For the ten months ending 31st October last the outbreaks of Sheep Scab were 303. During the same period of 1932 the corresponding figure was 204.

Tuberculosis.

72. Consideration has been given by the Council to a Report of the People's League of Health Special Committee appointed to make a Survey of Tuberculosis of Bovine Origin.

The views of the Council were expressed in the following resolutions:—

That the Tuberculosis Order of 1925 is wholly ineffective as a measure to decrease the incidence of Tuberculosis in the herds of Great Britain, and that the money spent on its operation is wasted.

That as a first and important step towards the eradication of Tuberculosis, Mastitis, Abortion and Johne's Disease in Cattle, it is essential to institute throughout the whole country routine inspection, not less than four times a year, by a whole-time Staff of Veterinary Officers.

The Council do not consider that pasteurisation, whatever may be its merits or demerits, can be an alternative to the above suggestion.

Quarantine Station.

73. During the fifth year's operations, ending March 31 last, the following stock was exported to the Dominions and Colonies named, after passing through the London Quarantine Station :—

	Cattle.	*Sheep.*	*Pigs.*	*Goats.*	*Total.*
Australia	51	4	5	—	60
New Zealand, via Australia	—	5	—	—	5
Antigua	—	2	—	—	2
Palestine	—	8	—	—	8
South Africa	59	150	7	2	218
South West Africa	3	—	—	—	3
Southern Rhodesia	2	—	—	—	2
Trinidad	—	—	—	3	3
	115	169	12	5	301

74. Comparative figures for the four previous years are as follows :—

Year ending—					
March 31, 1929	347	126	60	10	543
March 31, 1930	387	192	109	5	693
March 31, 1931	204	339	49	4	596
March 31, 1932	140	51	37	3	231

75. The total number of animals which have passed through the Station during the five years' administration by the Society is as under :—

1,193	877	267	27	2,364

The costs of administration, after crediting the Ministry with the veterinary inspection fees, are as follows :—

	£	*s.*	*d.*
1928/29	1,010	13	4
1929/30	874	18	1
1930/31	1,465	1	5
1931/32	1,584	12	5
1932/33	1,346	18	2
	£6,282	3	5

76. The five years' lease of the Quarantine Station from the Port of London Authority expired on the 28th December, 1932. An arrangement was arrived at with the Port of London Authority for an extension of the tenancy on a quarterly

basis pending consideration by the Empire Marketing Board, or its successors, of the future of the Station.

77. The Annual Report issued in June last by the Empire Marketing Board includes the following reference to the Station :—

> "The London Quarantine Station continues of great value in facilitating the export of pedigree livestock to oversea Empire countries. The five years' period for which the Board's grant to the Station was originally approved expired in December 1932. Owing to the economical and efficient administration of the Station by the Royal Agricultural Society of England, a balance from the grant remained unspent at that date, and the Board has agreed that this unspent balance may be used for continuing the Station's work. The Board again wishes to express its appreciation of the valuable services of the Royal Agricultural Society of England in the management of the Station."

78. In the seven months of the sixth year commencing April 1, 1933, the following stock has passed through the Quarantine Station :—

71st Period, commencing March 30—*April* 13	2	Cattle	Southern Rhodesia
72nd Period, commencing April 15—*May* 1	1	Ayrshire bull	

(A special quarantine period was fixed to enable this animal to be shipped by "direct" steamer to Hobart, Tasmania, to undergo 6 months' quarantine prior to transhipment to New Zealand.)

73rd Period, commencing May 13—*May* 29	2	Cattle	Australia
74th Period, commencing June 1—*June* 15	10	Cattle	
	24	Sheep	
	34		South Africa
—*June* 16	4	Cattle	Canada
	38		
75th Period, commencing June 19—*July* 3	4	Sheep	Australia
76th Period, commencing July 20—*Aug.* 3	2	Cattle	Southern Rhodesia
77th Period, commencing Aug. 15—*Aug.* 29	2	Sheep	Australia
	2	Pigs	
	4	Sheep	New Zealand, via Australia
—*Aug.* 31	2	Goats	Barbados
—*Sept.* 1	1	Bull	Southern Rhodesia
	11		

78th Period, commencing Sept. 15—Sept. 29	24	Cattle	South Africa
	29	Sheep	
	6	Pigs	
—Sept. 30	1	Pig	Palestine
	60		
79th Period, commencing Oct. 3—Oct. 17	14	Sheep	New Zealand, via Australia
	2	Sheep	Australia
	16		

79. Cattle shipments to Australia can be resumed after the "close season", which ends on December 1, and a quarantine period, commencing November 20, has been fixed to coincide with a sailing on December 5. Fifty head of cattle, the majority of which are intended for the Sydney Agricultural Show, have been booked, and will completely fill the Station. It is understood that a further 20 head of cattle are awaiting shipment to that Dominion.

80. A quarantine period, commencing December 8, has also been fixed to coincide with a "free freight" sailing to South Africa on December 23.

81. Exporters have reported a considerable increase in the number of enquiries received for livestock during the past few months, and this is evidenced by the number of animals which have been or are to be shipped in the last few months of this year.

82. Since the last Annual General Meeting the Canadian Government have agreed to the importation of livestock from this country after passing through the London Quarantine Station. A hitch has, however, occurred in the arrangement owing to the fact that no cargo steamers from London call at Quebec where the Canadian Quarantine Station is situated. The steamers usually discharge at Montreal where there is *no* quarantine station, and the Canadian Authorities will not permit animals to be landed at Montreal and sent back to the Quebec Quarantine Station. The question is the subject of communication between the Ministry of Agriculture and the Canadian Authorities.

83. During the winter months stock can be shipped to Halifax or St. Johns, and enter the Quarantine Station there for a period of only 14 days, a reduction from the 30 days' detention imposed where animals do not enter the London Quarantine Station.

84. The New Zealand Government have not yet accepted our quarantine scheme for direct importation, but recent notifications in the Press are to the effect that the period of

6 months' quarantine in another country has been reduced to 3 months, where animals destined for New Zealand have passed through the London Station. In effect, cattle can be shipped to give direct delivery at Hobart, Tasmania, and after 3 months' quarantine there can be transhipped to New Zealand.

85. The administration and general working of the London Quarantine Station has continued to run smoothly, and no difficulty has been experienced in fixing quarantine periods to enable exporters to ship their stock without undue delay.

86. The Station has been repainted internally and externally during the year, and is in good repair.

87. The Society was informed in September last that there would be no funds available from any Government source after December 25th next, and consequently notice to terminate the tenancy was given to the Port of London Authority. Since then, however, the Ministry of Agriculture has requested the Society to administer the Station under existing conditions until the end of March 1934.

88. Everyone is agreed that the closing of the Station would be a calamity and discussions are now taking place between the Ministry and representatives of Breed Societies in an endeavour to find ways and means for the future management of the Station which has proved such a boon to exporters of pedigree stock from this country.

Research.

89. Volume 93 of the Journal issued this year contains the customary annual report of the progress of the work being carried on by means of the Council's grant for research.

90. In connexion with the investigations into the disposal of Sugar Beet By-Products undertaken by the Norfolk Agricultural Station, a further article, dealing with "Bullock Feeding on Sugar Beet Tops" appeared in Vol. 93. Other reports will be issued as the work proceeds.

91. The examination of the Woburn Farm data has been completed and the article on "The Loss of Lime from Light Soils" included in the last Journal, is the first of the papers to be published by the Rothamsted staff as the result of this examination.

92. Work is being continued in connexion with the Inoculation of Lucerne at the Rothamsted Experimental Station, and on Mastitis in Cows at the Research Institute of the Royal Veterinary College.

93. Experiments have been begun this year at the Rothamsted Station with the object of measuring the electrical power

required for various operations about the farm buildings. The number of units of electricity is being compared with the amount of fuel and oil used by an oil engine—usually a tractor—in the performance of various important processes. In each case the machine will be worked at what appears to be its maximum efficiency and the number of units of electricity used by the motor and the fuel and oil used by the tractor will be estimated; time and labour involved in starting up the tractor and placing it in position will also be measured for comparison with the corresponding figures for the electric motors.

94. Data will be accumulated to throw light on depreciation of equipment. The results will be stated so that any person using them can convert them into cash values by inserting his own costs of installation and his own price per unit of current. Full labour times will also be recorded.

95. In the first instance the electric motor and the combustion engine will each work for short periods during the full period of any trial so as to obtain figures as strictly comparable as possible. The advantage of the short intervals is that in general the farm, and especially the medium-sized farm, requires relatively small amounts of material at any given time so that in practice an appliance would not be working continuously for a large number of consecutive hours. In planning the measurements the Rothamsted staff has the advantage of advice by Dr. Denham of the Institute for Research in Agricultural Engineering, and Mr. Orwin of the Agricultural Economics Research Institute, Oxford, and Mr. Rowland of the General Electric Company. The two former gentlemen are able to help in making the results of more general application, while Mr. Rowland is familiar with the manufacturers' side and can ensure that all electrical appliances are being worked at their full efficiency.

Discontinuance of "The Farmer's Guide".

96. *The Farmer's Guide to Agricultural Research,* as stated earlier in this report, has ceased as a separate publication, but it will appear without curtailment within the covers of the Society's *Journal* and will be sent when ready to all Governors and Members. The next issue—in January next—will include *Farm Crops, Dairy Farming and Dairy Work, Diseases of Animals—Prevention and Treatment, Farm Economics, The Feeding of Live Stock, Farm Implements and Machinery, Pests and Parasites, Soils and Manures.*

Research Medal.

97. On the ground that it had not achieved the purpose the Committee had in view when it was instituted, the offer of

the Society's Medal for an essay or monograph giving evidence of original research, has been discontinued.

New Gold Medal.

98. It is proposed to strike a Gold Medal of new design to be awarded for distinguished services to Agriculture, either in Practice or Science, at intervals of one year or longer. The award of the Medal will carry with it Honorary Membership of the Society.

At their meeting on November 1st, the Council unanimously decided that the first recipient of the Medal should be Sir Thomas Hudson Middleton, K.C.I.E., K.B.E., C.B.

Entomological Society's Centenary.

99. Lord Hastings, Chairman of the Botanical and Zoological Committee, and Mr. Cecil Warburton, the Society's Zoologist, were appointed to represent the Society at the Centenary Celebrations of the Entomological Society of London on May 3 and 4.

University of London.

100. Lord Mildmay of Flete was the representative of the Society at the Ceremony of laying the Foundation Stone of the new buildings of the University of London in Bloomsbury performed by His Majesty the King on June 26.

"Queen Victoria Gifts".

101. A grant of £180 has been made to the Royal Agricultural Benevolent Institution by the Trustees of the Queen Victoria Gifts Fund for the present year to be devoted to gifts as follows: Six gifts of £10 each to Male candidates; three of £20 each to Married Couples; and six of £10 each to Female candidates—the distribution in each class to be left until after the election to pensions by the Institution.

Since 1906 the Trustees of the Fund have paid over to the Institution a total sum of £4,220.

Medals for Cattle Pathology.

102. In the annual examination for the Society's prizes held at the Royal Veterinary College, the Silver Medal was won by Mr. R. L. Kaura, Nakodur, Dist. Jullundur, Punjab, India, and the Bronze Medal by Mr. N. H. Brooksbank, 57 Ravensdale Road, Stamford Hill, London, N.16. The examination was conducted by the Professors of the College and comprised written and oral work in the diseases of cattle, sheep and swine.

National Diploma in Agriculture.

103. At the thirty-fourth annual examination held this year at the University of Leeds from April 19 to 26, the following

50 candidates were successful in gaining the National Diploma in Agriculture :—

Diploma with Honours.

Albert James Thompson, South Eastern Agricultural College, Wye, Kent.

Diploma.

George Cave Abbott, Midland Agricultural College, Sutton Bonington, Loughborough.
Ernest Walter Barker, Seale Hayne Agricultural College, Newton Abbot, Devon.
Frank Birchall, University of Leeds.
Alfred John Bird, Harper Adams Agricultural College, Newport, Shropshire.
George Swinburne Blair, University of Leeds.
Walter Charles Nickerson Churchyard, University College, Aberystwyth.
Robin Cousins, East Anglian Institute of Agriculture, Chelmsford.
Thomas Cross Creyke, University of Leeds.
John Downey, University College, Aberystwyth.
Jack Doyle, Midland Agricultural College.
William Campbell Dyer, Seale Hayne Agricultural College.
George Eric Fearnside, University of Leeds.
Richard John Gayton, University of Reading.
John Robert Gilks, Harper Adams Agricultural College.
Francis George Haines, East Anglian Institute of Agriculture.
Henry Charles Hare, University of Leeds.
Allan Lester Hemingsley, Harper Adams Agricultural College.
Francis Michael Hollis, East Anglian Institute of Agriculture.
Peter Holmes, Seale Hayne Agricultural College.
Arthur Hutchings, Seale Hayne Agricultural College.
Peter Christie Jack, Jnr., Greigston, Cupar, Fife.
Eric Vincent Knight, South Eastern Agricultural College.
James Kerr Lamberton, University of Glasgow and West of Scotland Agricultural College.
William George Lawrance, Seale Hayne Agricultural College.
Cecilia M. E. Philipps Lloyd, Harper Adams Agricultural College.
Alexander McArthur, West of Scotland Agricultural College, Glasgow.
Leo John McHardy, University College, Aberystwyth.
Edgar Albert Martin, University of Leeds.
Kennethina Matheson, University of Glasgow and West of Scotland Agricultural College.
Thomas Henry Matthews, Seale Hayne Agricultural College.
Dudley Albert Thomas Maynard, Seale Hayne Agricultural College.
James Russell Moffatt, South Eastern Agricultural College.
John Carlisle Nowell, South Eastern Agricultural College.
George C. L. Palmer, University of Reading.
James Parlane, West of Scotland Agricultural College.
Wilfrid Graham Spear Perry, Seale Hayne Agricultural College.
Thomas Mackesy Prossor, Edinburgh and East of Scotland College of Agriculture.
Alexander Murrell Reece, Harper Adams Agricultural College.
Robert Barr Sillar, West of Scotland Agricultural College.
James Paterson Struthers, University of Glasgow and West of Scotland Agricultural College.
Donald George Sutherland, West of Scotland Agricultural College.
Arthur Thomas Thwaites, Seale Hayne Agricultural College.

James Morris Trew, South Eastern Agricultural College.
Frank Newman Turner, University of Leeds.
John Weir, West of Scotland Agricultural College.
Arthur John Whitlock, Seale Hayne Agricultural College.
Harry Wilkinson, Armstrong College, Newcastle-upon-Tyne.
Stephen Williams, University College, Aberystwyth.
John Athelstan Wyatt, Seale Hayne Agricultural College.

National Diploma in Dairying.

104. The thirty-eighth Annual Examination for the National Diploma in Dairying took place in September at the University and British Dairy Institute, Reading, for English and Welsh students, and at the Dairy School for Scotland, Auchincruive, Ayr, for Scottish students. Sixty-eight candidates were examined at the English centre, of whom thirty-seven were awarded the Diploma ; and thirty-two presented themselves at the Scottish Centre, of whom fourteen obtained the Diploma—one candidate at each centre attained to the Honours standard. The names of the successful candidates are below :—

ENGLISH CENTRE.

Diploma with Honours.

Richard John Gayton, The University and British Dairy Institute, Reading.

Diploma.

Helen Mary Bennett, The University and British Dairy Institute, Reading.
Ellen Birchall, Lancashire County Council Dairy School, Hutton, Preston.
Leopold Frederick Brinkman, East Anglian Institute of Agriculture, Chelmsford.
Elizabeth Grace Bunting, Studley College, Warwickshire.
Frederick George Byford, East Anglian Institute of Agriculture.
Jessie Chapman, East Anglian Institute of Agriculture.
Robin Cousins, East Anglian Institute of Agriculture.
John Downey, University College of Wales, Aberystwyth.
Mary Mildred Isabel Eaton, Lancashire County Council Dairy School.
William John Elgie, The University and British Dairy Institute, Reading.
John Boyce Fry, The University and British Dairy Institute, Reading.
Frances Christine Gee, Studley College, Warwickshire.
Constance Olga Gill, The University and British Dairy Institute, Reading.
Thomas Goss, Seale Hayne Agricultural College, Newton Abbot.
Ellen Muriel Parker Gray, The University and British Dairy Institute, Reading.
Marjorie Mehring Haley, Lancashire County Council Dairy School.
Mary Gretta Heath, Midland Agricultural College, Sutton Bonington.
Arthur Hutchings, Seale Hayne Agricultural College.
Christopher Kingsley, East Anglian Institute of Agriculture.
Hilda Kohn-Speyer, Studley College, Warwickshire.
Elizabeth Marion Laity, The University and British Dairy Institute, Reading.

Monna Désiré Light, Studley College, Warwickshire.
Mary Lumley, Lancashire County Council Dairy School.
Dudley Albert Thomas Maynard, Seale Hayne Agricultural College.
Mary Hulme Miller, Lancashire County Council Dairy School.
Laura Joan Parry, The University and British Dairy Institute, Reading.
Ronald John Reith, The University and British Dairy Institute, Reading.
Vera Ross, Studley College, Warwickshire.
Cyril Rowe, The University and British Dairy Institute, Reading.
Charles Arthur Stanger, Midland Agricultural College.
Mary Storey, The University and British Dairy Institute, Reading.
Margaret Bowes Taylor, Midland Agricultural College.
Anthony Thomas George Trew, The University and British Dairy Institute, Reading.
Thomas Cox Waterman, Seale Hayne Agricultural College.
Ruth May West, The University and British Dairy Institute, Reading.
John Athelstan Wyatt, Seale Hayne Agricultural College.

SCOTTISH CENTRE.

Diploma with Honours.

John Thacker, Corner House, Reeves Avenue, Newcastle, Staffs.

Diploma.

Edith Jean Anderson, 64 Murray Place, Stirling.
Jane Millar Brown, Templand, Thornhill, Dumfriesshire.
Charles Johnstone Bryden, Co-operative Buildings, Irvine Road, Crosshouse, Kilmarnock.
Eric Butterfield, Tofts Crescent, Dalry, Ayrshire.
Jessie Crawford Cameron, 27 Lamington Road, Cardonald, Glasgow.
Thomas Cross Creyke, 9 The Crescent, Thirsk, Yorks.
Ali Hasan Fahmi, Hummamat-El-Couba, Cairo, Egypt.
Jessie Lamont Hood, 14 Morven Crescent, Troon, Ayrshire.
James Kerr Lamberton, Cocklebie Farm, Stewarton, Ayrshire.
Nan McConachie, Cotterton, Brodie, Morayshire.
Evelyn Marr Morrison, Mill of Wardes, Insch, Aberdeenshire.
Jessie Munro, 17 Burleigh Street, Glasgow, S.W.1.
Katharine Wright, "Green Bank," Temple Sowerby, Penrith.

All the candidates at the Scottish Centre had been students at the Dairy School for Scotland, Auchincruive, Ayr.

Amendment of Bye-law.

105. In compliance with clause 7 of the Original Charter and Bye-law 122, the Council formally report for the information of Governors and Members that they have altered Bye-law 14 by the addition of the words which are printed in *italics* in the copy of the Bye-law reproduced below:—

> 14. The name of a Governor or Member struck off the List under Bye-laws 6, 12 or 13, may, on the application of the person affected, be restored by the Council, upon sufficient evidence being forthcoming of the identity of the person making the application with the Member on the Society's

books, and upon payment of the arrears, if any, of the subscriptions due, *unless the Council in its discretion shall remit such arrears.* The Council may, however, require such Governor or Member to submit himself for re-election before re-admitting him to the Society.

By Order of the Council,

T. B. TURNER,

Secretary.

16 Bedford Square,
London, W.C.1.

ANNUAL REPORT FOR 1933 OF THE PRINCIPAL OF THE ROYAL VETERINARY COLLEGE.

IT is to be regretted that the more than satisfactory progress recorded in 1932 in the control of scheduled contagious diseases of farm stock has not in all cases been maintained during 1933.

In the case of *Foot-and-Mouth Disease* there was a notable increase up to November 30th, 87 outbreaks being confirmed against 25 in 1932. Although the present figures are so greatly in excess of those for 1932 they are only about on a par with those for 1931. The customary stringent regulations made and the drastic steps taken by the Ministry of Agriculture and Fisheries have proved successful in every case. In every outbreak of this disease an endeavour is made to trace the source of the infection. Following exhaustive enquiries by the Ministry of Agriculture suspicion was attached in two cases to imported meat. When it is remembered that infection may arise from (1) importation of infected live animals, (2) carcases and other animal products, (3) feeding stuffs, (4) migrating birds, and (5) the movement of human beings from the Continent, one can easily understand the great difficulty of obtaining conclusive evidence of the manner in which the disease has been introduced in any particular case. However, when the number of outbreaks in this country is compared with those of other countries one is struck by the tremendous difference in our favour. The disease continues to be the subject of continuous research work, which is leading to the accumulation of a considerable amount of valuable knowledge.

The country remains free from *Glanders and Rabies.* The latter has not been met with in this country since 1922 and the very strict manner in which the quarantine regulations are enforced is the best assurance of our future immunity from this terrible disease.

It has again to be noted with regret that the progress made in the eradication of *Bovine Tuberculosis* has been disappointing; no noticeable improvement can be expected until there is a great alteration in the administration of the Milk and Dairies Act and the Tuberculosis Order of 1925. It must be admitted that many Local Authorities have failed either to utilize their powers or to realize their responsibilities in connexion with this disease. Fortunately an increasing number of Authorities are awakening to the need for appointing whole-time Veterinary Staffs, and a consequent improvement in the incidence of T.B. and other animal diseases may be anticipated. The modern trade custom of bulking into very large quantities the milk intended for large cities increases the infection of the milk out of all proportion to the number of cows giving infected milk, and this danger can only be countered by the efficient pasteurization of such milk.

In the case of *Anthrax* the figures are again favourable and show a decrease of about 10 per cent. over those for last year.

Swine Fever again shows a diminution in the number of outbreaks and the position is much better than in either 1932 or 1931. The decline in the number of outbreaks which set in in 1929 has steadily continued.

In the north-west of England the position with regard to *Sheep Scab* is most unsatisfactory; neither farmers nor Local Authorities seem to have been fully alive to their responsibilities. Marked improvement has, however, occurred in Wales and Scotland.

In the case of *Parasitic Mange* the figures show a slight increase over those of last year.

Although it is not one of the scheduled contagious diseases under the Diseases of Animals Acts, *Contagious Abortion* continues to cause immense loss to the owners of dairy herds. It has to be admitted that the extensive employment of the vaccine treatment has been of assistance in controlling the disease, but it is to be feared that it is as widespread in the country, if not more so, than it was twenty years ago. The "vaccine" treatment has been blamed by many authorities for the spread of the disease, and when it is remembered that the vaccination is really an inoculation with live organisms it must be admitted that there may be grounds for this belief, and the problem is receiving investigation. Where conditions are favourable the disease can be eradicated from a herd by frequent testing of the blood of each animal. Animals that furnish a positive reaction should be sold to a butcher or segregated.

Another disease affecting cattle, which is the cause of very great annual loss to stockowners, is that due to *Johne's Bacillus.* Characterized by a continuous and profuse diarrhoea leading to emaciation, it seldom appears in animals under the age of two years although these may be infected and infectious. In some parts of the country its ravages are as great as those of tuberculosis. The perfection of a reliable diagnostic agent must be the first step towards the eradication of this increasingly serious disease.

In last year's report I mentioned three of the more common diseases of poultry, viz., *B.W.D.*, or *Pullorum Disease, Avian Tuberculosis* and *Fowl Pox.* To these should be added one which has been very prevalent during the last two years—*Fowl Paralysis,* or Neuro-lymphomatosis. Much research has already been carried out in connexion with this disease in laboratories throughout this country and abroad, and it is believed that the disease is caused by a virus. Experiments have shown that it can be introduced into a "clean" flock by the purchase of infected cockerels. Birds bred from hens mated to infected cockerels usually show preliminary signs shortly before coming "into lay". It would appear that this disease is far more widespread among the flocks in the country than is generally supposed, and owners who desire to purchase good stock cockerels to improve their flocks must vigilantly guard against the risk of introducing such a serious ailment among their birds.

FOOT-AND-MOUTH DISEASE.

As stated previously the sporadic invasions of Foot-and-Mouth Disease show a great increase as compared with 1932.

Month.	Great Britain.	France.	Germany.	Holland.	Belgium.
January . . .	30	917	154	128	131
February . . .	10	972	79	54	53
March . . .	14	1,154	61	48	87
April	—	953	29	24	477
May	2	2,064	57	82	1,424
June	—	4,728	84	267	5,629
July	—	7,567	37	1,660	4,333
August . . .	6	12,296	29	10,833	5,711
September . . .	3	6,395	91	11,856	4,712
October . . .	22	2,792	69	7,373	2,670
November[1] . . .	—	—	—	—	—
December[1] . . .	—	—	—	—	—

[1] Owing to the earlier publication of this volume of the Journal, the figures for November and December are not yet available.

TUBERCULOSIS.

The following table shows the number of animals slaughtered under the Tuberculosis Order of 1925.

Year.	Animals slaughtered.
1929	15,532
1930	15,263
1931	18,603
1932	19,027
1933 (Jan. 1 to Sept. 30)	15,308

SHEEP SCAB.

The following table shows the number of officially confirmed outbreaks.

Year.	Number of outbreaks.
1929	666
1930	478
1931	347
1932	360
1933	566

SWINE FEVER.

The figures in connexion with this disease are again favourable.

Year.	Number of outbreaks.
1929	2,981
1930	2,408
1931	2,026
1932	1,555
1933	1,414

ANTHRAX.

Year.	Outbreaks.	Number of animals attacked.
1929	439	529
1930	392	446
1931	465	516
1932	344	418
1933	297	345

As in former years many Members of the Royal Agricultural Society have consulted the Staff of the Royal Veterinary College in cases of doubtful and obscure diseases amongst their stock, and help has been rendered whenever such was possible.

F. T. G. HOBDAY.

Royal Veterinary College,
Camden Town,
London, N.W.1.

ANNUAL REPORT FOR 1933 OF THE CONSULTING CHEMIST.

A CERTAIN decrease has to be recorded in the number of samples submitted by members for analysis—the total reaching 110 as against 136 in 1932. The causes of this gradual decline were fully dealt with in my last annual report, in which, however, I pointed out that many matters of interest or intricacy continue to be referred to the Society's laboratory. In addition to the above, 17 samples of Cider were analysed in connexion with the Derby Show of the Society.

The present depressed condition of agriculture has been largely responsible for the fact that trade, alike in fertilizers and feeding stuffs, has been of a restricted character. While imports have fallen off, it must be said that prices to purchasers, alike of fertilizers and feeding stuffs, have been very favourable. Fertilizers, with the exception of sulphate of ammonia and the other nitrogenous manures, such as nitrate of soda, cyanamide, etc., which are to a large extent ruled by it, have remained at much the same prices as twelve months ago. The fluctuations of price in the case of sulphate of ammonia, moreover, are known to be due to causes other than demand and supply for agricultural purposes. This circumstance prevents the unit figures of nitrogen value, as derived from them, being adopted as a fair guide for application to fertilizers generally. When one finds—as was the case in 1933—that sulphate of ammonia varied in price from £5 5*s.* to £6 17*s.* 6*d.* per ton, it is clear that dependence cannot be placed upon sulphate of ammonia as a basis for the value of nitrogen in fertilizers generally.

I have been induced to emphasize this, inasmuch as I have been urged to change the basis of valuing nitrogen for the purposes of the Tables, issued by the Central Association of Agricultural Valuers, for fixing the compensation to be paid for the unexhausted manurial residues of fertilizers and feeding stuffs. It has been put to me that, inasmuch as sulphate of ammonia can be purchased at 6*s*. 7*d*. or so per unit of nitrogen, this, or something like it, should be the figure all round, instead of the 10*s*. per unit made use of in the Tables. Against this view I may point to the fluctuations in price which sulphate of ammonia has undergone, the uncertainties as to its future price, and also to the fact that the unit of nitrogen in nitrate of soda stands at present at 11*s*. A more valid reason, however, for maintaining the figure at 10*s*. is that, particularly in considering the unexhausted value of feeding stuffs, one has to deal with nitrogen, not in the form of readily soluble salts like sulphate of ammonia, but in that of organic combinations which are of a less soluble and more lasting nature. Farmyard manure, *e.g.*, should not be valued for the nitrogen that it supplies merely as if this were so much sulphate of ammonia. It is far better, therefore, to be guided by the unit price of nitrogen as found in manures of organic origin and more lasting nature, which are less liable than sulphate of ammonia to price-fluctuations of uncertain character.

As the result of these considerations, and inasmuch as the conditions regarding the purchase of phosphatic and potassic materials remain much as they were a year ago, I have recommended the Central Association of Agricultural Valuers to make for the present no alteration in their Tables.

In regard to Feeding Stuffs, prices have undergone but small changes, and, speaking generally, continue to rule in favour of purchasers.

I would next refer to the Fertilizers and Feeding Stuffs Act, and would like to bear testimony to the very smooth working of this Act, and also to the immense benefits which it has conferred upon the agricultural world. On every hand there has been a steady improvement in the nature and quality of fertilizers and feeding stuffs and, where the Act has been actively administered by County and Borough Councils, the safeguards provided by it have been clearly shown. Not only have manufacturers and vendors come to recognize that they must be on their guard as to what they sell, but farmers themselves have got a better understanding of what the Act does for them and of how to make use of it. The Act indeed is not universally worked with the energy that one would wish to see; there still remain counties where the quarterly return to the Ministry of Agriculture is often marked "Nil". But this is, happily, exceptional.

Meantime, it may be said that the revised Regulations introduced at the instance of the Advisory Committee, to which legal force was attached as from August 11th, 1932, have constituted further improvements in the Act, and have shown the advantage of having a permanent Committee possessed of the power to make such changes as may from time to time be called for.

I would here refer again to two matters to which I drew attention in my last year's Report—(*a*) the quality of barley meal and (*b*) the occurrence of castor-oil bean in feeding stuffs. In respect of both these matters I am able to record a distinct improvement since last year; though I must allow that I hardly expected this in the case of barley meal owing to what I considered the giving of undue latitude as to what might be sold under the term " barley meal ". As a matter of fact, there has been a general improvement all round in the case of offals and of barley meal. Indeed, in many instances where —for safety's sake—a delivery of the latter has been designated as Grade II—I have found that it might quite well have been sold simply as " barley meal ".

The same general improvement can be recorded in respect of castor-oil bean in feeding cakes, etc. For the last two years I have been urging the importance of purchasers insisting on the entire exclusion of this poisonous material, and I have taken occasion to animadvert strongly on the practice of allowing the presence of a certain quantity of " castor " to " pass " unheeded, and on that of giving certificates which are misleading in nature as to the extent to which castor is present. All that I have since heard and experienced has confirmed me in my then conclusions. Possibly my remarks have not been without result in bringing about a better state of things in the trade, for the cases in which castor has been found, or harm been traced to its occurrence in purchased farm foods, have been but few. This adds one more to the list of instances where all sorts of difficulties have at first been apprehended by the trade, but have not in fact arisen in practice. So will it be, I feel sure, with the castor-oil bean trouble; if purchasers will but insist on having their goods guaranteed free of it, the trade will soon find a way to meet them.

Less satisfactory than the above is a matter which was the subject of a case in the High Court, and in which I was concerned as an expert witness. It had reference to the sale of kainit to a fruit-grower, who, in consequence of the improper application of it to gooseberry bushes, suffered a considerable loss. It came out in evidence that the purchaser who, it was alleged, had been advised to use kainit at the rate of 10 cwt. per acre, had applied indeed 10 cwt. to the acre, but had applied it only *round the stems* of the gooseberry bushes instead of evenly over the whole area. The result was that the bushes had received far more than could be safely given to them, that every bit of green growth, grass, weeds, etc., had been killed, and that the soil around the stems of the bushes had been entirely altered in its physical and chemical nature, presenting the appearance familiar to all agriculturists which results from the use of nitrate of soda to excess on land of heavy character. It was not that there was—as the decision of the Court might seem to imply—anything amiss with the kainit (which was of ordinary good quality), but that it had been improperly and excessively applied. An attempt was made by some witnesses called for the plaintiff to show that sulphate of potash, and not kainit should have been used, and no doubt the former is, at present, more favoured by fruit-growers. Although the decision of the Judge was in favour of the plaintiff's contention, it would be unfortunate if an impression went out that kainit—if properly and reasonably used—is a harmful fertilizer or unsuitable for use in fruit-growing. The use of a fertilizer is dependent on considerations other than that of its chemical composition, and, as with other fertilizers, there is a right way and a wrong way of employing kainit.

In recent years questions bearing on the harm done by cement and lime works to vegetation, and notably to fruit-trees, nurseries, etc., have occupied my attention to no small extent and have not infrequently been the subject of actions at law. Recently, however, improvements in methods have reduced the amount of gaseous emanations carrying fine dust with them, and, according to the Report (for 1932) of the Chief Inspector of Alkali, &c., Works, the trouble from this source has been greatly reduced.

Another feature of interest is the continued attention that is given to the conservation of waste materials of vegetable nature and their conversion, by the " Adco " or similar process, into useful fertilizing material to take the place of the limited and decreasing supply of farmyard or stable manure, the value of which, even in the light of the advanced use of artificial fertilizers, is recognized perhaps more than ever. The adoption of a process such as the " Adco " is becoming much more general, especially in the case of gardens where leaves, twigs, grass-clippings and similar vegetable matter are available.

Coming to fertilizers generally, it has been pointed out that, with the exception of the fluctuations in the case of sulphate of ammonia and dependent nitrogenous salts, prices have undergone hardly any change whatever. Nor has the number of them materially increased. The excellent compounded and concentrated products introduced by the Imperial Chemical Industries, Limited, have increased in favour, but are mainly useful for export purposes where the cost of conveyance is high.

A new form of phosphatic fertilizer, under the name of "Sulfurophosphate", has come forward in recent years. In the manufacture of this the ground phosphate of lime, instead of being treated, as in the case of superphosphate, with crude sulphuric acid and water is, after being mixed with carbonate of lime, heated with sulphur, and a product containing about 15 per cent. of phosphoric acid is obtained which, it is maintained, is of a readily available and quick-acting nature.

Attention is called to the increased use now being made of poultry manure it being, in the case of some large poultry farms, even available for purchase like other manures.

A fresh source of supply of potash salts has been found in the Catalonia district of Spain, some 45 miles from Barcelona. Borings made in 1930 seemed to indicate favourable prospects, and mining began in 1931. In that year 25,000 tons of potash salts were exported, the figure rising to 65,909 tons in 1932. Of this latter amount 8,855 tons went to the United Kingdom. From Spain, therefore, we may expect a useful supplement to the supplies of potash salts derived from the mines of Stassfurt (Germany) and Alsace (France) which have hitherto been the main sources of potash fertilizers.

The remarkable extension that has gone on in the production of sulphate of ammonia by the synthetic process, and the lower cost at which it can be obtained by this process, have had the effect of making the other methods, as practised at gas works, coke ovens, etc., no longer of themselves remunerative. While the agriculturist has benefited by the lower price consequent on the changes in manufacture, aided by competitive trading, the problem of disposal of their waste ammoniacal liquor by Corporation Gas Works and the like has become an increasingly difficult one.

Owing, doubtless, to its low cost there has been a considerable increase in the consumption of sulphate of ammonia in England and Scotland. In the case of most other fertilizers, however, consumption has declined under the existing conditions of our agriculture.

In regard to feeding stuffs it may be said that owing to the low prices for stock which have marked the past year, the use of these has been even more restricted than before; the situation as regards prices and quality has been favourable to buyers.

Of the staple cakes, linseed cake has varied in price from £8 2*s*. 6*d*. to £8 7*s*. 6*d* per ton; cotton cake from £5 15*s*. or £6 per ton in the early part of the year to £5 in July and £4 7*s*. 6*d*. in November. Ground-nut (earth-nut) cake has cost from

£7 5*s*. to £6 5*s*., and coconut cake £6 10*s*. to £5 15*s*. per ton. These have, with few exceptions, been found good and up to guaranteed quality. Palm kernel cake and meal appear to have largely dropped out of use, but soya cake, and more especially the extracted meal, are favourite foods with dairy farmers.

Again it is a pleasure to me to speak well of the many excellent compound cakes that are now to be had, and the convenient forms in which they are obtainable have caused them to increase in favour. So long as these continue to be made of good, sound materials (as indeed is the case with the great majority of those I have come across), and so long as they are sold (as also generally happens) at reasonable prices, one cannot consider the feeder of stock ill-advised to make use of them.

Maize-meal and maize products have, with few exceptions, been found to be good, but in some cases portions of the "cob" of the maize have found their way in, to the detriment of the quality of the material.

Though it cannot be called a new feeding material, there has been a considerable extension of the use of alfalfa meal for stock. This has resulted from improved methods of drying and grinding the alfalfa hay, and arrangements for drying and similarly preparing lucerne, grass, and other green-produce are being projected in this country.

Another material that has had an extended use, largely for feeding poultry and pigs, is meat-and-bone meal. It has been found at times difficult to draw the line between what can be called "meat meal" and what "meat-and-bone meal", but, on the whole, the provisions of the Fertilizers and Feeding Stuffs Act have been found to work smoothly.

The need for checking the composition of mixed meals made up at the purchaser's request is illustrated in an example given later on—as is also the inadvisability of using certain kinds of wheat as poultry food, Australian wheat generally being recognized as unsuitable. Mention is also made of the "fancy" prices at which so-called "iodized minerals" are sold to supply possible deficiencies in ordinary foods.

The question as to what is to be considered as "offals" and what as "flour" has long been a disputed one. The difficulty has arisen largely from the differences in milling practice adopted in different parts of the country, this being regulated, in measure, by local requirements. Further, it has been customary to use, in one part of the country, names for the different classes of offals which are quite unknown in other parts, and the same article may be known by one name in the north and by a different one in the south. So it comes about that one meets such terms as "middlings", "sharps", "boxings", "ran" or "ran-dan", "toppings", &c., all meaning much the same and indicating only variations—for local requirements—in the fineness of grinding and closeness of sieving. The same applies, in a measure, to the coarser portions severally known as " broad bran ", " ordinary bran ", and " pollards ", and to the grades of flour, " seconds ", " thirds ", etc. When, along with these, come such further distinctions as " coarse middlings ", " fine middlings ", etc., it will be seen how impossible it is to assign any definite significance to one grade or the other.

The passing into Law of the Wheat Act of 1932, however, has done much to clear up the difficulty, inasmuch as " offals " are defined by it as " the residual products which, in the process of milling wheat, are extracted therefrom as germ or for animal or poultry food ".

The Act further imposed a quota on flour milled in this country or imported from abroad. The stipulation was added, moreover, that wheat offals shall not be deemed to be flour merely because, in addition to the normal quantity of flour present in wheat offals, there is 7½ per cent. of flour which is not normally present.

Whether or not the 7½ per cent. as above stated were exceeded was, if necessary, to be determined by arbitration.

This may go some way to a settlement of the difficulty, but, for myself, I would have preferred that " flour " be stated in terms of the fibre which it contains and that, under offals, be included all the products other than flour obtained in the process of the milling of commercially pure wheat ; a statement of the amount of fibre in each being required.

This would bring the definition into line with the Fertilizers and Feeding Stuffs Act.

In the case of flour I would have suggested that this be defined as " the product of milling commercially pure wheat as grown, the product to contain not more than ·5 per cent. of fibre ".

In America an attempt was made to deal with the question by adopting a system of classification. The term " wheat feed " was made use of as the equivalent of " offals ", and a general division of offals was suggested into three classes under the respective designations of (*a*) Bran, (*b*) Standard Middlings, and (*c*) " Red Dog ". There were, however, also numerous sub-divisions going under such names as " red and brown shorts ", " gray shorts ", " white shorts ", mixed feed ", etc.

In England there has always been great diversity according to the part of the country in which the offals are produced, and the uses to which the offals are severally put. Bran itself is not infrequently classed as " broad bran " or as ordinary "bran" according to its fineness, the former being in favour among the feeders of hunters and race horses, and the latter being more generally used for cattle. The term "pollards" for a finer ground bran, though not so much used as formerly, is still employed.

Any attempt to compare the milling products of different countries has been rendered quite futile by reason of the diversity of practice that exists, and it would seem that each country must necessarily have its own classification.

The attempt has been made to introduce into this country the term "wheat-feed" (as used in America) as equivalent to offals generally. But to this I take decided objection, as the term "wheat-feed" would not convey to us what we understand by the "offals" of wheat. Moreover, as is illustrated by a case I quote later, the proposal would open the door to the application of the term to the siftings of wheat, weed-seeds and other impurities.

Still more recently, in our own country, another term, viz., "weatings", has been introduced by the Millers' Mutual Association Ltd., to describe the various kinds of offals apart from bran.

These, however, are again divided into two qualities, "weatings", with a fibre content not to exceed 5·75 per cent., and "superfine weatings", with a fibre content not to exceed 4·5 per cent.

I can see no advantage in this proposal. It introduces a new term "weatings", which has no particular meaning and is hardly distinguishable from the American term "wheat-feed" to which objection has been taken.

Nor does the term "weatings", any more than "wheat-feed", provide for bran or its varieties. "Weatings", like "wheat-feed", would imply the produce of wheat, of which bran is certainly one, and for which provision should be made. For myself I can see no better way of classifying wheat offals than to take the three broad divisions: (1) Bran, (2) Middlings, (3) Flour, and subdivide each of these so far as this may be required for local convenience.

Thus one might have :—

(a).	*(b).*	*(c).*
Broad Bran.	Coarse Middlings.	Flour.[1]
Ordinary Bran.	Fine Middlings.	
Pollards.		

The main objection which I have to the introduction into this country of such terms as "wheat-feed" or "weatings", is that we already have the Fertilizers and Feeding Stuffs Act, which clearly defines what wheat meal, wheat offals and millers' offals shall be. This Act, with its definitions, carries legal signification and imposes penalties for contravening or evading its provisions, and it is not, I maintain, open to the Millers' Mutual Association or any other Trade Organization to introduce or force upon purchasers anything which goes contrary to the intentions of the Act.

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[1] This to be defined as the product of milling commercially pure wheat as grown, the product to contain not more than 0.5 per cent. of fibre.

If, for example, a sample sold under the name " weatings " were taken officially under the Act and submitted to me in my capacity as official agricultural analyst, am I to judge it by the standard laid down by the Act or by that suggested by the Millers' Mutual Association ? Or, in the event of its being found to be impure, though not outside the limits laid down by the Association, would the vendor escape the penalties which the Fertilizers and Feeding Stuffs Act would impose ?

Bran, it would appear, comes to this country mainly from the Netherlands and, to less extent, from Italy ; while middlings are imported chiefly from Germany, the Netherlands, and (to less degree) Italy.

There was a marked increase in the import of middlings in 1931, 1932 and 1933, and of bran in 1932.

I follow now my usual course of mentioning matters of special interest which have arisen from the examination of samples sent to me by members.

A. FEEDING STUFFS.

1. *Canadian Wheat-feed.*

This follows appropriately what I have just said in relation to wheat offals, and emphasizes the difficulties which I suggest as likely to occur were the term "wheat-feed" to be adopted in this country as synonymous with " offals ".

A member sent me a sample of a delivery which had been sold to him under the name " Canadian wheat-feed " and which cost £5 per ton delivered. One would naturally have expected a material so sold to be the produce of wheat but, instead of this, I found it to consist of mere screenings of wheat and other grain, and to include weed-seeds of many kinds, amongst these being polygonum, rape and mustard seed, as well as some linseed, oats and barley. This came from Liverpool.

2. *Maize Meal and Maize Products.*

It is but seldom that I find maize meal to be other than pure and good. But in one case, when a member residing in Ireland sent me two samples of maize meal for the purpose of comparing them, I found that, while one lot was pure, the other had about 10 per cent. of ground oats.

In another case, where a member had purchased "Hominy Chop", receiving with it a guarantee of its containing oil 6.40 per cent., albuminoids 10.20 per cent. and fibre 5.95 per cent., I found it to have oil and albuminoids up to the guarantee, but the fibre was 2½ per cent. in excess, viz., 8.50 per cent. The vendors—a local Farmers' Association—at first refused to make any allowance, but ultimately, on my representations, they did so.

In yet a third instance, where maize formed a considerable part of a dairy compound meal, I found the fibre to be 6·56 per cent., whereas the guarantee had been 4.6 per cent. only. This excess of fibre was due to some of the "cob" of the maize being included. It might be mentioned that the presence of impurity of this kind, as of other husks, skins, etc., of seeds, has—according to the Fertilizers and Feeding Stuffs Act—to be declared.

3. *Compound Feeding Meals.*

It is not unusual for purchasers to leave it to merchants to mix together certain feeding materials to a desired prescription. But it is often well to have these checked by subsequent analysis, and to ensure that the right materials, and approximately in the desired proportions, have been supplied. In a case where a member had contracted for the supply to him of two different pig meals, one of which was to contain 4 cwt. of fish meal to 24 cwt. of middlings and 12 cwt. of barley meal, the other 4 cwt. of fish meal to 12 cwt. of middlings and 24 cwt. of barley meal, the proportion of fish meal used in the first mixture was found to be markedly deficient. In the case of a somewhat expensive material like fish meal, it is better, as a rule, that a feeder should purchase separately and himself mix it with the other foods. Then he knows that he has the full amount and no more.

4. "*Fancy*" *prices for specialized foods,* "*iodized minerals*", *etc.*

I have frequently had occasion to refer to the purely "fancy" prices which purchasers are sometimes ready to give for compound foods for which some special virtues are claimed, or which are stated to supply deficiencies that may occur in the case of ordinary farm foods. The prices of these seldom bear much relation to their actual value.

Of this nature was a material called "Codolettes", which was made up in small boxes and sold like squares of chocolate. The price of these was—for 500 in boxes, £3 3*s*., for 1,000, £6. I made an analysis of the cubes, with results as follow :—

Moisture	9·19
Oil	26·02
Albuminoids	11·38
Carbohydrates, etc.	45·71
Fibre	4·93
Mineral matter	2·77
	100·00

This was quite good of its kind, but microscopical examination showed it to be nothing more than palm kernel meal with cod-liver oil ; on weighing a number of the cubes I found that the price would work out at £129 per ton.

In another instance £16 a ton was paid for "Iodized Minerals"—two kinds being supplied, the one called "cattle salts", the other "pig salts". In each case iodine was present, but there was little more than a trace of it, the bulk being carbonate of lime and common salt. By adding to the ordinary feeding a little steamed bone flour and a sprinkling of potassium iodide, all the advantages of such materials as these "iodized minerals" could have been got and at an immensely lower cost.

5. *Bran and other offals of Wheat.*

(*a*) *Broad bran and ordinary bran compared.* There is a strong preference—especially among those who have the care of hunters and race horses—for the coarse class of bran known as "broad bran", sold frequently at a considerably higher price than is charged for ordinary bran.

A member sent me two samples to compare. The analyses were :—

	No. 1.	No. 2.
Moisture	13·95	13·72
Oil	4·95	3·81
*Albuminoids	16·56	14·75
Carbohydrates, etc.	53·45	53·41
Woody Fibre	6·91	9·19
†Mineral Matter	4·18	5·12
	100·00	100·00
*Containing Nitrogen	2·81	2·36
†Including Sand and Silica	·09	·13

The price of No. 1 was given as £7 15*s.* per ton, and of No. 2 as £6 12*s.* 6*d.* per ton, both delivered. No. 2, although perhaps not quite as clean as No. 1, was quite good, and I can see nothing to warrant the difference of price between the two.

(*b*) *Sharps containing mustard seed.* A member sent me a sample of sharps which he had received from a local Farmers' Association. The second day after giving it to 60 small pigs and 12 older ones, all the young pigs were found to be " off colour ". Next day one died and subsequently 20 more. On changing the food and giving medicine, the remainder recovered. The older pigs had had the sharps also, but they did not seem to be affected.

On a sample being sent to me, I found it to contain mustard seed in considerable amount. This had, no doubt, been the cause of the losses. Liability was not disputed, and the purchaser obtained £48 12*s.* 2*d.* by way of compensation.

(*c*) *German middlings—really low grade flour.* A sample sent me under the name " middlings ", and costing £5 2*s.* 6*d.* per ton, was found to have not more than 2·86 per cent. of fibre, whereas 5½ per cent. is about the range of ordinary middlings. Moreover, while ordinary middlings have about 20 per cent. of flour, this sample had 61 per cent. Whether it had been imported under the name " middlings " in order to escape the duty on flour I could not ascertain, but it certainly was not " middlings " but a low-grade flour.

When a feeder of pigs or poultry purchases middlings, he will look to have a certain proportion of the bran of the wheat present, and not practically flour only.

6. *Poultry Foods.*

(*a*) *Wheat.* A poultry feeder complained to me that food which he had given to his birds was either rejected by them or that they developed disease. He added that a neighbour using the same food for his poultry had had the like experience. With the poultry food he sent me a sample of wheat similar to what had been used in the mixed food. I examined these, finding the meal to be largely composed of wheat, and free from any poisonous seeds, metals, etc. But the wheat I found to be a very hard one, and, so far as my experience went, I believed it to be Australian. It is well known among poultry feeders that birds will not take Australian wheat unless they are forced to do so, and will not do well on it.

(*b*) *Grit.* Another poultry feeder sent me a sample of the grit he was using for his birds. In this I found little sharp scales of mica, which I should take to be decidedly objectionable. One should be careful as to the kind of grit used for poultry, for I have at times found both arsenic and lead present in poultry grits.

B. FERTILIZERS.

1. *Lime.*

On the whole—and largely owing to the Fertilizers and Feeding Stuffs Act—there has been an improvement in lime products included under the Act.

The following is an instance, however, of a badly burnt lime, sold in Yorkshire as "ground lime" at 29*s*. per ton delivered :—

*Total Lime	63·06
Oxide of Iron and Alumina	1·54
†Carbon dioxide	25·91
Water, Magnesia, etc.	2·41
Sand and Silica	7·08
	100·00
*Containing Caustic Lime	22·96
†Equal to Carbonate of Lime	58·88

The price was much too high for a material of this quality—a good ground lime should contain quite 80–85 per cent. of caustic lime.

2. *Lawn Sand.*

A sample sent me by a member and costing £5 10*s*. per ton delivered gave the following analysis :—

Moisture	1·99
Organic Matter and Loss on Ignition	3·91
Metallic Iron	22·75
Sand	67·57
Lime, Sulphate of Iron, etc.	3·78
	100·00

This was practically a mixture of iron filings and sand, and to charge £5 10*s*. per ton for such a material is ridiculous.

3. *Poultry Manure.*

As mentioned, there has been considerable demand for this, and the following are analyses of two lots that were purchased by a member.

	A.	B.
Moisture	57·87	33·48
*Organic Matter and Ammonia Salts	19·08	53·31
†Phosphoric Acid	2·55	3·68
Lime	2·73	2·84
Magnesia, Alkalies, etc.	4·76	3·87
Sand	13·01	2·82
	100·00	100·00
*Containing Nitrogen	1·74	3·57
Equal to Ammonia	2·11	4·34
†Equal to Phosphate of Lime	5·57	8·04

" A " cost 43*s*. per ton delivered, no analysis being guaranteed. But " B ", which was in drier and finer condition and was of much better quality, cost only £2 per ton delivered, and was distinctly cheap. Its quality was especially high.

4. *Treated Peat.*

Many have been the attempts made to render peat and similar carbonaceous materials more active and available for agricultural and horticultural use. I had recently sent me, for examination, a sample of what was called "activated carbon", this being prepared from peat by destructive distillation, whereby the volatile products were removed; it was hoped to use the residue as a fertilizer. Of this I made an analysis, obtaining the following results :—

Moisture	11·48
*Organic Matter	82·42
Phosphoric Acid	·06
Lime	2·60
Potash	·01
Oxide of Iron, Alumina, Carbonic Acid, etc.	3·31
Insoluble Siliceous Matter	·12
	100·00
*Containing Nitrogen	1·01

Though quite a nice preparation and in good condition for ready distribution in the soil, there was little in this to justify its being put forward as a fertilizer, the nitrogen being in a practically unavailable condition.

MISCELLANEOUS.

Waters.

(*a*) *Water containing Iron Salts in solution.* Complaint was made in the case of a water coming from Sussex that it contained, as it proceeded from a spring, iron salts in quantity. Though the water was clear at first, it subsequently threw down a considerable deposit in the pipes. This it was desired to remove.

I analysed the water, finding it to be very soft and containing only 7.28 grains per gallon of total solids. The deposit, which had already separated out when the water reached me, was composed of ferrous carbonate, this having formed from the soluble bi-carbonate of iron, in which state the iron originally existed. In order to free a water from this objection the simplest way—if the supply be only a limited one—is to run the water, before it enters the pipes, into a shallow tank where it will get aerated and deposit the ferrous carbonate, the clear water being subsequently run off, or, better still, passed through a bed of sand. If required on a larger scale, an effective arrangement is in use at several waterworks in the country, by which the water is run in a cascade over a series of plates or discs arranged one above the other. The soluble iron salts, on exposure to the air, are precipitated and the deposit collects on the plates, the water emerging clear, when it can be filtered through sand.

(*b*) *Water containing Lead in solution.* In previous reports I have referred to waters of soft nature which act rapidly upon lead pipes, and I have noted how previous treatment of such waters with lime, before allowing them to pass into lead pipes, is successful in preventing the action.

This system of previously treating certain waters in Devonshire has, indeed, been made obligatory on Municipalities. The success of the operation depends, however, upon the treatment with lime being regularly done and efficiently maintained. In a case brought to my notice where, after treatment, the water passed through a quarter mile of lead pipes, I found that, whereas in the first instance only ·0042 grains of lead per gallon were present, a sample taken a year later gave double that amount, *viz.* ·0084 grains per gallon.

SOIL.

A member sent me—from Yorkshire—a sample of soil and turf of which he complained that it grew buttercups in profusion and a mass of weeds. My analysis of the soil was as follows :—

(Soil dried at 100°C.)

Organic Matter and Loss on Heating	18·88
Oxide of Iron	3·23
Alumina	5·67
Lime	·53
Magnesia	·13
Potash	·29
Soda	·18
Phosphoric Acid	·53
Sulphuric Acid	·33
Insoluble Silicates and Sand	70·23
	100·00
Nitrogen	·65

The soil, far from being, as my correspondent thought, a poor one, was, on the contrary, rich rather than otherwise, It had abundant organic matter and nitrogen, was fairly supplied with lime and potash, and was exceptionally rich in phosphoric acid.

Nor did I think the weed so prominent as alleged, though the herbage generally was strong and coarse. On further enquiry I found that it had been the habit to mow it yearly and apply farmyard manure freely. This is the very thing that a soil so rich in vegetable matter and nitrogen does not require, and the tendency would be to produce a rank growth. It is rather the use of lime and mineral manures that is to be recommended on such land, and, better still, the interposing of a period of close grazing in order to give the finer grasses a chance to develop.

The samples analysed for members from December 1st, 1932, to November 30th, 1933, have been as follows :—

Cotton Cake	1
Decorticated Ground Nut Cake	2
Compound Feeding Cake and Meal	14
Cereals, Offals, etc.	19
Feeding Fish Meal	5
Feeding Meat Meal	1
Basic Slag	1
Compound Manure	6
Bone Meal, &c.	3
Meat-and-Bone Meal	1
Shoddy, etc.	13
Potash Materials	1
Lime, Chalk, etc.	4
Milk, Butter, etc.	3
Soil	3
Water	21
Miscellaneous	12
	110

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1, Tudor Street, E.C.4.
December, 1933.

ANNUAL REPORT FOR 1933 OF THE BOTANIST.

THE number of enquiries dealt with in the Botanical Department was smaller than that of the previous year, the numbers being 196 in 1933 and 220 in 1932. The sections dealing with the fungoid diseases of plants and the identification of weeds account for practically the whole of the loss. The relative lack of enquiries in the former section is satisfactory, for it agrees with one's general experience that serious crop losses through the attacks of these pests were exceptionally small. The dryness of the growing season was probably responsible for this state of affairs. Whether it has led, by providing better conditions for cleaning the land, to an appreciable reduction in the weed flora remains to be seen.

As was the case in the previous year, the botanist represented the Society on the Cereal Synonym Committee of the National Institute of Agricultural Botany, and again had the opportunity of inspecting the trial plots. The Committee's function is to collect all of the cereal novelties placed on the market each season and compare them critically with those in cultivation in order to obtain information as to which are new and which are nothing more than old forms introduced under new names. For this purpose a type collection has been assembled, alongside which these new introductions are grown. The comparisons are made throughout the growing season at an experimental station in Scotland and at another in Wales, as well as at the Institute's own experimental ground. At harvest time the reports from the experts at each station are presented to the Committee, which then proceeds to check them on the plots. Its findings are immediately reported to the seedsmen responsible for the introductions and an opportunity is offered them to meet the Committee on the plots and, in cases where synonymy is believed to exist, to demonstrate to the Committee any distinctive features of the variety in question.

The proceedings are thus similar to those of the Potato Synonym Committee, which has done so much to check the indiscriminate renaming of old varieties.

This year synonyms are less numerous than last. Those to which attention was called were :—

Wheat
- White Suncrest synonymous with Victor
- Twenty-one ,, ,, Weibull's Standard
- Red Suncrest, a mixture of red wheats

Oats
- Kingora synonymous with King
- Victoria ,, ,, Victory

SEED TESTING.

Six samples of home-grown red clover seed were examined in detail for purity and germinating capacity. One only had been screened sufficiently to reduce the proportions of weed seeds and poorly developed clover seeds to a satisfactory figure. The cereals tested (18 samples) were either winter oats or barley. All of them proved to be fit for sowing, though none of them could be classed as good samples. The grass seeds (four samples) were mixtures made up from the buyers' specifications for either temporary or permanent pastures. Rough separations of the component species showed that in one of these a serious mistake had been made and Italian ryegrass had been added instead of perennial ryegrass. Mass germinations, that is tests on a composite sample and not on the individual species, were satisfactory. The other seed samples tested were of swedes, thousand-headed kale, sainfoin, mixed white clover and alsike, and various vegetables. The total, 41, is very similar to that of the previous year.

FUNGOID DISEASES.

The incidence of fungoid plant diseases during 1933 was unusual. Towards the end of May it was evident that the farm crops were in an exceptionally healthy condition and that the commoner fungoid pests of orchards, though present, were making little or no headway. This state of affairs persisted throughout the growing and ripening season with the result that, as losses due to such agencies were reduced to a low level, over-average yields could be predicted where other conditions were favourable. The one exception to this general statement was provided by the mildews. Though not excessively prevalent, bad outbreaks were seen on apple trees, on peas grown for canning and especially on swedes. The outbreaks on swedes were commonly associated with attacks of *aphis*, and the double infestation must have appreciably reduced the weight of the crops.

Comparatively few specimens were sent in for identification, and apple scab, which is generally represented by about a dozen, was for once unrepresented. It was as a matter of fact easily to be found throughout the season, but under the dry conditions prevailing it made very little progress. One of the more interesting specimens was a bundle of wheat plants, sent in early in June, which were heavily infected with yellow rust. They caused some surprise, for in connection with some investigations then in progress a close watch was being kept on a large collection of varieties of wheat and also on crops being grown under a wide range of soil and manuring conditions in East Anglia. Rust, broadly speaking, was practically non-existent on these, though experiments showed that on occasions the air was sufficiently heavily charged with rust spores to start up an epidemic. Possibly the dryness of the atmosphere prevented the germination of these spores and so accounted for the lack of infection. The infected crop, which was growing near the Norfolk coast, was inspected. The crops in the neighbourhood were found to be, at the most, slightly infected, and the only explanation that suggested itself was that the severity of the outbreak was associated with an over-generous application of sulphate of ammonia.

The seasonal conditions were again exceptionally favourable for limiting the severity of outbreaks of potato blight. The usual reports of early outbreaks were received from Cornwall in May. But the disease failed to spread appreciably and many of the early crops in the potato-growing districts of eastern England were lifted before any symptoms of it were visible. The advent of a wetter period soon after harvest brought conditions more suitable for the development of the fungus, but the unusually early maturation of the haulms seems to have prevented anything in the nature of a severe epidemic, and at lifting time the tops were generally healthy. Some disease was found in the tubers, even where stem and foliage infection seemed negligible, but even so the damage was usually far under the average of that experienced during the past few years.

In July several enquiries were received in anticipation of the necessity for a campaign of disease prevention. These all referred to dusts rather than the more usual liquid fungicides. The value of dusting has now been investigated at a number of research stations, and though it is still questionable whether it is quite as effective a method of controlling blight as spraying has proved to be there can be no doubt that it has advantages of its own. Thus the use of fungicides in the form of dust does away with the troublesome process of preparing Bordeaux or Burgundy mixture and also the carting of considerable volumes of water. Moreover, as the dust can be stored, a supply can always be at hand for immediate application.

Two specimens of silver leaf, both on Victoria plums, were received for confirmation of the grower's diagnosis. This disease is still far too prevalent and will continue to be so until the wisdom of cutting one's losses as soon as possible is generally recognized. The natural recovery of silvered trees is so rare a phenomenon that it is not worth while waiting to see whether it may occur and meanwhile allowing the disease to spread.

Further enquiries concerning the use of Ceresan and Agrosan as seed dressings were received. From the reports sent in by members who have been advised to use them, and from the results of carefully controlled tests there have been opportunities of watching, there can be no question about their value for checking the growth of seed-borne fungus spores. They afford such perfect control of the smuts (for which formalin or blue-vitriol steeps are generally used) and of the troublesome fleck disease of seedling oats, that their use should become universal.

IDENTIFICATIONS.

Amongst the specimens sent in for identification, weeds and grasses were more sparsely represented than usual, whilst the varieties of cereals were more numerous. Amongst the grasses were two specimens of some interest as the species are not indigenous to this country. They were vigorous plants of *Panicum crus-galli* and *Setaria glauca*, which had been found growing in a crop of carrots. Both of these aliens have been recorded previously in this country. The only weed of general interest was *Lepidium draba*, which was reported to be so prevalent on a Norfolk farm that it was causing serious damage to the crops. The weed has been referred to several times in previous reports, and though it has become widely distributed during the last few years, specimens have not been received at all frequently of late. Its control, as was anticipated, has proved difficult owing to the rapidity with which it colonizes large areas by means of slender underground runners. The spraying technique used against charlock checks its development appreciably, but the only effective means of eradication known at present is provided by well-managed bare fallows. A few curious specimens were received in the course of the season. In one the flowering umbels of a polyanthus primrose had been replaced by rosettes of foliage leaves which, when detached, rooted readily and gave rise to independent plants. The same kind of abnormality occurred in a broad-leafed plantain; the specimen sent bore half a dozen rosettes, each about four inches in diameter, on stems which should obviously have carried flowers. In yet another plantain the spike formed a pyramid, some eight inches in length, of closely packed foliage leaves, each flower having become viviparous. None of these abnormalities is particularly rare. Another, a flowering head of white clover from which a well-developed runner was growing, probably is, though the difficulty of detecting such an occurrence may account for its rarity.

Two plants suspected of poisoning stock were sent in for identification and for a report on the symptoms which would result from their being eaten. In the one case three calves had died and the usual process of elimination appeared to leave only a grass which was abundant in their litter as the possible cause. As the grass, creeping bent, is a common constituent of pastures, this too had to be ruled out. The trouble was ultimately found to be due to lead poisoning, the lead having been obtained from paint on the woodwork of the building in which the calves were housed. In the second case the death of a cow was assigned, without, as far as could be seen, any real evidence, to the eating of either spruce or Corsican pine.

One collection of twigs cut from hedge plants in the winter, for which the names were required, consisted of spindle tree, wayfarer's tree, buckthorn and sloe. These, it was stated, constituted the greater part of the hedges on the farm.

GENERAL ENQUIRIES.

Several enquiries were received about the possible value of cold storage for seeds of lucerne, wheat and barley. They appear to owe their origin to newspaper accounts of a process known as "Yarovization" or "vernalization", discovered by a Ukrainian plant breeder, Lyssenko.[1] Its application results in seeds so treated giving mature plants from a fortnight to a month earlier than they would normally. The seed is soaked in water until the germ swells appreciably and then held at a low temperature in darkness for a period of six days to a month. Lyssenko's results have received independent confirmation, but much remains to be done to determine the precise treatment requisite for each kind of seed. The value of the process under English conditions is problematical, but in countries in which environmental conditions demand rapidity of maturation it appears to have obvious possibilities.

Information about the possibility of growing soya beans was again in demand and it was interesting to hear that two varieties of the plant had been grown this season, and well ripened seed secured, under garden conditions, in Perthshire.

The question about the best stocks on which to grow Cox's Orange Pippin, and the best variety for interplanting in order to secure pollination, was again raised. Whilst a choice can be made from a number of varieties flowering at the same period as Cox's Orange, one of the most certain pollinators appears to be Worcester Pearmain. The choice of stock depends on several circumstances, but where, as is generally the case, early fruiting is desired the use of Jaune de Metz is advisable, for with this spurs will frequently develop on maidens.

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[1] See under "Vernalization," page 165 of this Volume.

One member, whilst writing for information on another subject, asked how long grain could retain its vitality under favourable conditions. The belief, long since exploded, that it will live almost indefinitely has gained a new lease of life through the publication in the *Times* of an illustration of a branching ear of wheat which was said to have owed its origin to grains found during the excavations of a site at Mohenjo Daro, in Sind, dating back some 4,000–5,000 years. The account was apparently well authenticated. A brief enquiry into the matter showed that those responsible for it were unaware of the following facts : that the grain found there was " badly carbonized ", that is to say that chemically and physically it was merely charcoal ; that it belonged to the distinctive race of round-grained wheats known as *Triticum sphaerococcum* ; and that the specimen illustrated and said to be unlike any wheat in cultivation was *T. turgidum Plinianum,* a variety resembling in many respects the branching form of Rivet wheat, once grown in this country under the name of " mummy wheat ".

Three queries with regard to varieties of maize suitable for forage growing and for silage were received, and a fourth one on the possibility of growing a two-purpose crop. The requirement in this case was a variety suitable for the production of both edible cobs and a forage crop. In a favourable season satisfactory cobs can be grown with the variety Golden Bantam, but neither this nor any of the few rapidly maturing sugar maizes are sufficiently vigorous growers to yield heavy forage crops.

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ANNUAL REPORT FOR 1933 OF THE ZOOLOGIST.

Introduction.

The remarkable weather conditions of 1933 were naturally reflected in the incidence of insect pests on the various crops and on the applications for advice received by the Zoological department. The first months of the year were characterized by the exceptionally early appearance of certain pests, and by an unusual number of complaints of the injury done by slugs on the most diverse crops. Later it was to be expected that pests notoriously dependent on dry weather should be very destructive, and this proved to be the case with regard to some—especially "red spider" and *Sitona* weevils; but curiously enough the most important of them—turnip fly—was not abnormally injurious. Apparently the spring weather had not favoured the development of the true turnip flies, but other species of flea-beetle which affect Brassicas were very much in evidence, especially in the seed beds of gardens and allotments. During the hot summer months insect pests of many kinds were extremely abundant. Nevertheless, few enquiries were received with regard to them. This was probably because the failure of crops was so obviously due mainly to drought that contributory causes, such as insects, excited little interest. Undoubtedly the predominant pest was *Aphis.* All the usual species were present in unusual abundance, and several crops—such as carrots and peas—not often much troubled by *Aphis,* this year suffered rather severely.

Many specimens of insects and arachnids were sent for identification—some of them in consequence of the discovery of Colorado beetle at Tilbury—but they were generally of a harmless nature.

CEREALS.

To judge from the number of enquiries received by this department most of the recognized corn flies were less injurious than usual during 1933. Little was heard of the wheat bulb-fly, and even less of frit-fly in oats, so highly destructive in some seasons, nor did I receive any reports of gout-fly attack in barley. In August and September there were indications that the stem saw-fly, *Cephus pygmaeus,* was rather abundant in some crops, but the cereal pests most complained of were in a different category.

There were the normal number of cases of wireworm and leatherjacket injury, but during the winter months the greatest harm seemed to be done by slugs—principally on winter wheat, but also to some extent on winter oats. In several samples sent for investigation the work of slugs was evident and no other cause for failure could be found.

Towards harvest, wheat—like almost every other crop—was in some cases heavily infested by *Aphis,* and thrips was also complained of, but the rapid hardening of the grain prevented much harm being done. An unusual abundance of "ear cockles", due to the stem eelworm, occurred in some wheat crops.

FARM AND ALLOTMENT CROPS.

Slugs all the year round, and *Aphis* of all kinds during the summer, conveys the general impression left by the enquiries concerning most crops during 1933. Hardly any crop escaped injury by *Aphis*. There were complaints of it on carrots and on peas—crops which seldom suffer markedly from this pest, while on beans, Brassicas, potatoes, sugar beet, etc., there were especially severe attacks.

All the pea pests appear to have been especially abundant. The dry weather favoured the *Sitona* weevils which are so destructive to seedling peas; the pea moth, generally present to some extent, was unusually prevalent; and there was more than normal injury from pea thrips. A case of what is generally called the potato eelworm (*Heterodera schachtii*) in peas in an allotment suggested the possibility of the allotment having become infested in the manner mentioned in last year's Report, namely from eelworm cysts in the soil adhering to seed potatoes. In that report I drew attention to the fact that at Cambridge living cysts had been found on such seed potatoes and might constitute a danger to other crops in gardens.

I received unexpectedly few reports of turnip-fly, a notoriously dry-weather pest. The spring weather conditions were apparently unfavourable to its development and there was no indication of excessive injury to turnip crops, though there were several complaints of trouble in seed beds in allotments from those species of flea-beetles which affect plants of the cabbage kind.

Slugs. Much attention has been given to the question of the treatment of slugs in gardens and in the field. I am particularly obliged to Mr. E. D. Nicholson with whom I have had correspondence on the matter and who has kept me informed of the results of his experiments. The methods available are (1) the distribution of an insecticide, (2) the use of poison bait, and, on the small scale, (3) trapping.

Copper sulphate is exceedingly effective against slugs, but it is injurious to rough-leaved plants. Moreover, such insecticides are useless unless a direct hit is made on the slugs, so that it is waste of material to distribute them except at times when the creatures are fully at work. Mr. Nicholson obtained fair results with sprays of alum neutralized by the addition of lime water, but on the whole he found that the use of poison bait was much more effective, the bait employed being bran mixed with paris green. The Canadian formula is paris green ½ lb., bran 25 lb., molasses 1 quart, water about 2½ gals. The dry and wet ingredients are mixed separately and then thoroughly stirred together. Mr. Nicholson found that wild birds would not touch it, but it would be unsafe to use it where domestic fowls run. The same correspondent employed slug-traps with some success in a strawberry bed, and his observation that ground beetles were also attracted is mentioned in the "Fruit" Section of this Report.

FRUIT.

The predominant pest of the year was *Aphis*, and on trees unsprayed by tar distillates in the winter there were very severe attacks, and even trees so sprayed suffered more than usual. Woolly *Aphis* on apple trees was very prevalent, and cherry trees, currants and strawberries were more than usually subject to attack by their respective varieties of *Aphis*.

It is not surprising, in view of the dry season, that "red spider" did much injury to various fruit trees. It is well known that tar distillates are ineffective against the eggs of this pest, and there is even evidence that "red spider" is encouraged by the use of these sprays, which presumably kill insects which might reduce its numbers by feeding on its eggs. The Ministry of Agriculture and Fisheries (Bulletin 66) suggests a tar distillate spray in January to destroy the eggs of *Aphis* and apple sucker, and a petroleum emulsion spray in March to deal with the eggs of red spider and capsid bugs.

The last-named pests—capsid bugs—were very much in evidence during the summer, the apple capsid being more than normally destructive, while other species attacked bush fruit as well as various vegetable crops, especially potatoes.

Among other fruit pests with regard to which enquiries were dealt with were Codlin moth and the eyed hawk moth in apple trees, "big bud" in black currants, and the raspberry beetle. There was also a case of severe injury to strawberries by slugs, and here slug traps were successfully employed. I was informed that in these traps there were always a number of beetles. I asked for specimens, and found them all to be examples of the common ground-beetle, *Pterostichus madidus*. These beetles, normally carnivorous and therefore regarded as benefiting agriculture, are nevertheless occasionally found damaging crops. There have been recent complaints of them in sugar beet, but it is in strawberry beds that they have chiefly been recognized as doing considerable damage for a long time past. They do not injure the foliage, but nibble the fruit, rendering it unsaleable. It is not unusual for carnivorous creatures to show a partiality for sweet things—perhaps by way of dessert after their animal food—and however desirable ground-beetles may be among ordinary crops, their presence is not to be welcomed in strawberry beds. It is worth noting that slug traps prove attractive to them as well as to the even more destructive slugs.

FOREST AND TIMBER PESTS.

Among the few applications relating to forest pests three concerned the poplar, the insects being the goat-moth, the poplar longicorn and the hornet clear-wing moth. There was also a case of willow scale (*Chionaspis salicis*). Information was also sought concerning certain timber pests, including " death-watch " beetles, wood-wasps, and a beetle of the genus *Callidium*.

ANIMAL PARASITES.

During the year a certain number of questions concerning animal parasites were answered, and specimens identified. Ticks were received from cattle in Scotland and from a pony in Wales, as well as a large number from domestic animals in our African colonies, and some from India. There is nothing of special interest to record in this section.

MISCELLANEOUS NOTES.

Among the specimens sent for identification there are always a few that have excited curiosity by their striking appearance rather than by any harm they seem to be doing. I never fail to receive an example or two of the great wood-wasp *Sirex gigas*, which not seldom emerges from pine planks in houses and alarms people by its formidable and hornet-like appearance. In England it is of some importance as a timber destroyer, but in New Zealand it has become a serious forest pest, and a large number of the parasites which prey upon it here have been exported to that country in the endeavour to control it.

Large caterpillars are often sent—generally those of hawk-moths. In the present year these included the privet hawk, the elephant hawk, and, from a potato crop, a specimen of the death's-head moth, our largest caterpillar. It appears to have been more common than usual during the past season, for several observers have recorded its occurrence. Its natural food is the Deadly Nightshade, to which our cultivated potato is nearly allied.

Many enquiries relate to household insects, sometimes unimportant, but often the cause of considerable annoyance or even damage. The "silver fish"—*Lepisma*—which frequents kitchen drawers, and feeds on starchy food, is generally included. In November I received specimens, from a London house, of the small German cockroach, *Blattella germanica*. Everyone is familiar with the common cockroach, *Blatta orientalis*, and the great American cockroach is common enough on shipboard and in our ports, but I have rarely had complaints of *B. germanica*. This is fortunate, for it is more difficult to eradicate than its larger relatives owing to its small size and its partiality for inaccessible warm places. It has long been a very great nuisance in Canada and in the United States, where it is known as the "Croton Bug", a name it received from the fact that it made its first appearance in America in the water systems of the Croton Oil Works. The measures against it consist of trapping, poisoning and the closing up as far as possible of all chinks and crannies where it can breed. Where there are domestic pets, poisons have to be used with care. Recent Canadian experiments indicate that sodium fluoride, powdered over sinks, hot water pipes, etc., is very effective, and good results have also been obtained from the use of derris powder.

As usual questions have been asked about insects and mites infesting stored foodstuffs. Grain weevils and moths come in this category, and the bacon beetle, *Dermestes lardarius*, is a frequent example. A curious case was the occurrence of a beetle in a tin of canned salmon from Kamchatka. The beetle proved to be the very widely distributed *Creophilus maxillosus*, and its presence was of no particular significance.

The Colorado beetle scare at Tilbury led, I am told, to a remarkable collection of insects being sent to the Ministry of Agriculture and Fisheries in mistake for the beetle, and a few reached this department. They were either lady-birds or spiders.

A serious complaint was received from one quarter that moles were destroying bulbs. The matter requires further investigation, for I received no proof that the bulbs were eaten by the moles, though no doubt the animal might work considerable havoc in a bulb field simply by its burrowing. Again, if a bulb showed signs of having been attacked it would be interesting to know whether it had contained the larva of the narcissus fly, which one would imagine to be more attractive to the insectivorous mole than a vegetable bulb. In view, however, of the fact that poisoned onions have been advocated as a way of destroying moles the possibility that they have a liking for tulip bulbs cannot be dismissed without further knowledge.

CECIL WARBURTON.

School of Agriculture,
Cambridge.

Royal Agricultural Society of England.

Established May 9th, 1838, as the English Agricultural Society, *and incorporated by Royal Charter on March 26th, 1840)*

Patron.

HIS MOST GRACIOUS MAJESTY THE KING.

President for 1934.

THE EARL OF STRADBROKE, K.C.M.G.

Trustees.

Year when first elected on Council.	
1919	H.R.H. The Prince of Wales, K.G., *York House, S.W.1.*
1922	H.R.H. The Duke of York, K.G., 145 *Piccadilly, W.1.*
1930	H.R.H. The Duke of Gloucester, K.G., *Buckingham Palace, S.W.1.*
1905	Adeane, Charles, C.B., *Babraham Hall, Cambridge.*
1895	Bedford, Duke of, K.G., *Woburn Abbey, Bedfordshire.*
1893	Cornwallis, Lord, *Linton Park, Maidstone, Kent.*
1887	Crutchley, Percy, *Sunninghill Lodge, Ascot, Berkshire.*
1904	Daresbury, Lord, C.V.O., *Walton Hall, Warrington.*
1898	Devonshire, Duke of, K.G., *Chatsworth, Bakewell, Derbyshire.*
1910	Harlech, Lord, C.B., *Brogyntyn, Oswestry, Shropshire.*
1909	Hazlerigg, Sir Arthur, Bart., *Noseley Hall, Leicestershire.*
1891	Stanyforth, Lt.-Col. E. W., C.B., *Kirk Hammerton Hall, York.*

Vice-Presidents.

1922	Brocklebank, Rev. C. H., *Westwood Park, West Bergholt, Essex.*
1921	Burrell, Sir Merrik R., Bart., *Floodgates, West Grinstead, Horsham.*
1908	Derby, Earl of, K.G., *Knowsley, Prescot, Lancashire.*
1924	Desborough, Lord, K.G., *Taplow Court, Maidenhead.*
1900	Greaves, R. M., *Wern, Portmadoc, North Wales.*
1929	Harewood, Earl of, K.G., *Harewood House, Leeds.*
1903	Harrison, William, *Albion Iron Works, Leigh, Lancashire.*
1922	Mildmay of Flete, Lord, *Flete, Ermington S.O., Devon.*
1915	Portland, Duke of, K.G., *Welbeck Abbey, Worksop, Notts.*
1914	Powis, Earl of, *Powis Castle, Welshpool, Mont.*
1928	Tredegar, Viscount, C.B.E., *Tredegar Park, Newport, Mon.*
1907	Yarborough, Earl of, *Brocklesby Park, Habrough, Lincolnshire.*

Ordinary Members of the Council.

1922	Alexander, Hubert, *The Croft, Sully, near Cardiff (Glamorgan).*
1931	Barclay, E. E., *Brent Pelham Hall, Buntingford (Hertfordshire).*
1911	Behrens, Major Clive, *Swinton Grange, Malton (Yorks, N. Riding).*
1932	Bell, John, *The Hall, Thirsk, Yorks. (London).*
1930	Benyon, Henry A., *Ufton Court, near Reading (Berkshire).*
1928	Bohane, Edward, C.B.E., *Simmons Court House, Donnybrook, Co. Dublin (Ireland).*
1918	Burke, U. Roland, *Edensor House, Bakewell (Derbyshire).*
1923	Burkitt, William, *Grange Hill, Bishop Auckland (Durham).*
1931	Burrell, Walter R., *Knepp Castle, Horsham (Sussex).*
1929	Buxton, Capt. H. G., *Cokesford Farm, Tittleshall, King's Lynn (Norfolk).*
1928	Christy, Capt. Hugh A., *Llangoed, Llyswen, Breconshire (South Wales).*
1924	Cotterell, Sir John R. G., Bart., *Garnons, Hereford (Herefordshire).*
1921	Courthope, Col. Sir G. L., Bart., M.C., M.P., *Whiligh (Sussex).*
1921	*Dampier, Sir W. C. D., Sc.D., F.R.S., *Upwater Lodge, Cambridge.*
1927	Dugdale, Major W. Marshall, D.S.O., *Llwyn, Llanfyllin, Mont. (North Wales).*
1929	Elgin, Earl of, K.T., *Broomhall, Dunfermline (Scotland).*

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* Nominated Member of Council.

Year when first elected on Council.	Ordinary Members of the Council (*continued*).
1922	Eltisley of Croxton, Lord, *Croxton Park, St. Neots* (*Huntingdonshire*).
1913	Evens, John, *Burton, Lincoln* (*Lincolnshire*).
1926	Everard, W. Lindsay, M.P., *Ratcliffe Hall, Leicester* (*Leicestershire*).
1933	Everett, Major Norman, *Rushmere, Ipswich* (*Suffolk*).
1921	Fenwick, E. Guy, *North Luffenham Hall, Stamford* (*Rutland*).
1928	Forshaw, Thomas, *The Stud, Carlton-on-Trent, Newark* (*Notts.*).
1924	*Garrett, Col. Frank, C.B.E., *Aldringham House, Leiston, Suffolk.*
1922	Gates, B. J., *Pembury, Tring* (*Buckinghamshire*).
1916	Gilbey, Sir Walter, Bart., *Elsenham Hall, Elsenham* (*Essex*).
1931	Glossop, C. W. H., M.P., *Bramwith Hall, near Doncaster* (*Yorks., W. Riding*).
1925	Hale, Windham E., *Mowbreck Hall, Kirkham* (*Lancashire*).
1925	Hall, J. Herbert, *Hill House, Mobberley, Knutsford* (*Cheshire*).
1930	Hansford, Major C. C., *Watts Barn, Codrington, Chipping Sodbury* (*Gloucestershire*).
1905	Harris, Joseph, *Brackenburgh Tower, Penrith* (*Cumberland*).
1926	Hastings, Lord, *Melton Constable Park* (*Norfolk*).
1919	Hobbs, Robert, *Kelmscott, Lechlade, Glos.* (*Oxfordshire*).
1931	Jervoise, Major F. H. T., *Herriard Park, Basingstoke* (*Hampshire*).
1923	Johnstone, Capt. G. H., *Trewithen, Grampound Road* (*Cornwall*).
1932	Kilpatrick, James, *Craigie Mains, Kilmarnock* (*Scotland*).
1931	Mackintosh, Sir Harold, *Conyngham Hall, Knaresborough* (*Yorks., W. Riding*).
1909	Mansell, Alfred, *College Hill, Shrewsbury* (*Shropshire*).
1928	Matthews, R. Borlase, *Greater Felcourt, East Grinstead* (*Surrey*).
1927	Neame, Thomas, *The Offices, Macknade, Faversham* (*Kent*).
1922	Neilson, R. B., *Holmwood, Sandiway, Northwich* (*Cheshire*).
1932	*Nicholson, A. C., *Trent Ironworks, Newark, Notts.*
1930	Quested, J. Egerton, *The Firs, Cheriton, Folkestone* (*Kent*).
1928	Radnor, Earl of, *Longford Castle, Salisbury* (*Wiltshire*).
1924	*Ransome, Edward C., *Highwood, Ipswich.*
1927	*Russell, Sir John, D.Sc., F.R.S., *Rothamsted Experimental Station, Harpenden, Herts.*
1932	Ryman, W. W., *Manor Farm, Wall, Lichfield* (*Staffordshire*).
1923	Sample, C. H., 26, *St. Mary's Place, Newcastle-on-Tyne* (*Northumberland*).
1932	Scott, Capt. J. B., *Rotherfield Park, Alton* (*Hampshire*).
1932	Shaftesbury, Earl of, K.P., G.C.V.O., *St. Giles's House, Salisbury* (*Dorset*).
1931	Shelley, Sir John F., Bart., *Posbury House, Crediton* (*Devonshire*).
1930	Smith, Eustace Abel, *Longhills, Lincoln* (*Lincolnshire*).
1907	Smith, Fred, *Deben Haugh, Woodbridge* (*Suffolk*).
1929	Stanley, Lord, M.C., M.P., *Knowsley, Prescot* (*Lancashire*).
1933	Stedman, L. Foster, *Machen House, Lower Machen, near Newport,* (*Monmouthshire*).
1912	Strachie, Lord, *Sutton Court, Pensford* (*Somerset*).
1929	Strafford, Earl of, *Wrotham Park, Barnet* (*Middlesex*).
1923	Tanner, E. Craig, *Eyton-on-Severn, Wroxeter* (*Shropshire*).
1920	Thornton, F. H., *Kingsthorpe Hall, Northampton* (*Northants*).
1924	Wakefield, Jacob, *Sedgwick House, Kendal* (*Westmorland*).
1933	Walker, Sir Ian, Bart., *Osmaston Manor, Derby* (*Derbyshire*).
1933	Walker, John, *Knightwick Manor, Worcester* (*Worcestershire*).
1926	Webb, Frank, *Billington Estate Office, Leighton Buzzard* (*Bedfordshire*).
1929	Webb, S. Owen, *Streetly Hall, West Wickham* (*Cambridgeshire*).
1925	Weigall, Lt.-Col. Sir Archibald G., K.C.M.G., *Englemere, Ascot* (*London*).
1931	Wheatley, Col. C. J. H., *Berkswell Hall, Coventry* (*Warwickshire*).
1918	Wickham-Boynton, T. L., *Burton Agnes Hall, Driffield* (*Yorks., E. Riding*).

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*Nominated Members of Council.

STANDING COMMITTEES.

⁎ Under Bye-Law 73, the President is a Member *ex officio* of all Committees, and the Trustees and Vice-Presidents are Members *ex officio* of all Standing Committees except the Committee of Selection and General Purposes.

The Honorary Director is a Member ex officio of all Committees.

Finance Committee.

Adeane, C. (*Chairman*)
Devonshire, Duke of
Cornwallis, Lord
Daresbury, Lord
Burrell, Sir Merrik
Courthope, Sir G. L.
Hazlerigg, Sir A.
Burke, U. Roland
Crutchley, Percy
Greaves, R. M.
Hall, J. H.
Harrison, W.
Mansell, Alfred
Smith, E. A.
Wheatley, Col.

Journal and Education Committee.

Cornwallis, Lord (*Chairman*)
Elgin, Earl of
Mildmay of Flete, Lord
Burrell, Sir Merrik
Dampier, Sir W. C. D.
Hazlerigg, Sir A.
Russell, Sir John
Adeane, C.
Brocklebank, Rev. C. H.
Burkitt, W.
Burrell, Walter R.
Mansell, Alfred
Neame, T.

Chemical Committee.

Smith, Fred (*Chairman*)
Shaftesbury, Earl of
Harlech, Lord
Dampier, Sir W. C. D.
Russell, Sir John
Gates, B. J.
Greaves, R. M.
Hale, W. E.
Neilson, R. B.
Quested, J. E.
Sample, C. H.

Botanical and Zoological (Forestry and Orchards) Committee.

Hastings, Lord (*Chairman*)
Cornwallis, Lord
Courthope, Sir G. L.
Hazlerigg, Sir A.
Benyon, H. A.
Burrell, Walter R.
Christy, Capt. H. A.
Dallimore, W.
Dugdale, Major
Jervoise, Major
Le Sueur, A. D. C.
Neame, T.
Weetman, Col. C. C.

Veterinary Committee.

Burrell, Sir Merrik (*Chairman*)
Radnor, Earl of
Hastings, Lord
Mildmay of Flete, Lord
Strachie, Lord
Cotterell, Sir John
Gilbey, Sir Walter
Hobday, Sir F. T. G.
Shelley, Sir J. F.
Weigall, Sir A. G.
Barclay, E. E.
Bell, John
Burke, U. Roland
Burkitt, W.
Burrell, Walter R.
Buxton, Capt. H. G.
Crutchley, Percy
Fenwick, E. Guy
Gates, B. J.
Glossop, C. W. H.
Harris, Joseph
Johnstone, Capt.
Mansell, Alfred
Quested, J. E.
Smith, Fred
Stanyforth, Lt.-Col.
Tanner, E. C.
Thornton, F. H.
Wheatley, Col.

Committee of Selection and General Purposes.

Daresbury, Lord (*Chairman*)
The President
Harlech, Lord
Mildmay of Flete, Lord
Courthope, Sir G. L.
Brocklebank, Rev. C. H.
Greaves, R. M.

And the Chairman of each of the Standing Committees.

Research Committee.

Devonshire, Duke of (*Chairman*)
Radnor, Earl of
Cornwallis, Lord
Hastings, Lord
Burrell, Sir Merrik
Dampier, Sir W. C. D.
Russell, Sir John
Weigall, Sir A. G.
Adeane, C.
Burkitt, W.
Burrell, Walter R.
Buxton, Capt. H. G.
Matthews, R. B.
Neame, T.
Scott, Capt. J. B.
Smith, Fred
Thornton, F. H.
Wigan, Capt. D. G.

Stock Prizes Committee.

Evens, John (*Chairman*)
Radnor, Earl of
Daresbury, Lord
Burrell, Sir Merrik
Cotterell, Sir John
Shelley, Sir J. F.
Weigall, Sir A. G.
Barclay, E. E.
Behrens, Major Clive
Bell, John
Brocklebank, Rev. C. H.
Burke, U. Roland
Burkitt, W.
Buxton, Capt. H. G.
Crutchley, Percy
Everard, W. L.
Everett, Major N.
Fenwick, E. Guy
Forshaw, T.
Glossop, C. W. H.
Greaves, R. M.
Hobbs, Robert
Mansell, Alfred
Neilson, R. B.
Quested, J. E.
Smith, Fred
Tanner, E. C.
Webb, Frank
Webb, S. Owen
Wickham-Boynton, T. L.
The Stewards of Live Stock

Judges Selection Committee.—*Same as Stock Prizes Committee.*

Implement Committee.

Stanyforth, Lt.-Col. E. W. (*Chairman*)
Courthope, Sir G. L.
Dampier, Sir W. C. D.
Burke, U. Roland
Burkitt, W.
Buxton, Capt. H. G.
Crutchley, Percy
Evens, John
Garrett, Col.
Gates, B. J.
Greaves, R. M.
Harrison, W.
Matthews, R. B.
Nicholson, A. C.
Ransome, E. C.
Sample, C. H.
Webb, S. Owen
The Steward of Implements

Showyard Works Committee.

Burke, U. Roland (*Chairman*)
Daresbury, Lord
Burrell, Sir Merrik
Hazlerigg, Sir A.
Mackintosh, Sir H.
Bell, John
Burkitt, W.
Burrell, Walter R.
Crutchley, Percy
Hall, J. H.
Neilson, R. B.
Nicholson, A. C.
Sample, C. H.
Stanyforth, Lt.-Col.
Webb, S. Owen
Wheatley, Col.

Dairy and Produce Committee.

Burkitt, W. (*Chairman*)
Strachie, Lord
Burrell, Sir Merrik
Dampier, Sir W. C. D.
Mackintosh, Sir H.
Weigall, Sir A. G.
Crutchley, Percy
Evens, John
Greaves, R. M.
Johnstone, Capt. G. H.
Kay, Dr. H. D.
Smith, Fred

Horticultural Committee.

HAZLERIGG, Sir A. (*Chairman*)	DARESBURY, Lord	BURKE, U. ROLAND

General Ipswich Committee.

The Whole Council, with representatives of the Local Committee.

Honorary Director.—U. ROLAND BURKE.

Secretary.—T. B. TURNER, 16 Bedford Square, London, W.C.1.

Editor of Journal.—Prof. J. A. SCOTT WATSON, *School of Rural Economy, Oxford.*

Consulting Chemist.—Dr. J. AUGUSTUS VOELCKER, M.A., 1 *Tudor St., E.C.*4.

Consulting Veterinary Surgeon.—Prof. Sir F. T. G. HOBDAY, C.M.G., F.R.C.V.S., *Royal Veterinary College, Camden Town, London, N.W.*1.

Botanist.—Prof. Sir R. H. BIFFEN, F.R.S., *School of Agriculture, Cambridge.*

Zoologist.—CECIL WARBURTON, M.A., *School of Agriculture, Cambridge.*

Consulting Engineer.—S. J. WRIGHT, B.A., *Institute of Agricultural Engineering,* 37A *St. Giles, Oxford.*

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Publisher.—JOHN MURRAY, 50A *Albemarle Street, W.*1.

Solicitors.—GARRARD, WOLFE, GAZE & CLARKE, 18 *St. James's Place, S.W.*1

Bankers.—WESTMINSTER BANK, LTD., 1 *St. James's Square, S.W.*1.

DISTRIBUTION OF GOVERNORS AND MEMBERS OF THE SOCIETY, AND OF ORDINARY MEMBERS OF THE COUNCIL.

Electoral District.	Division.	Number of Governors and Members.	Number of Ordinary Members of Council.	Ordinary Members of Council.
A.	Bedfordshire	62	1	Frank Webb.
	Cheshire	436	2	J. H. Hall; R. B. Neilson.
	Cornwall	70	1	Capt. G. H. Johnstone.
	Derbyshire	304	2	U. Roland Burke; Sir Ian Walker, Bart.
	Dorset	96	1	Earl of Shaftesbury.
	Hampshire and Channel Islands	321	2	Major F. H. T. Jervoise; Capt. J. B. Scott.
	Hertfordshire	170	1	E. E. Barclay.
	Lancashire and Isle of Man	313	2	Windham E. Hale; Lord Stanley.
	Middlesex	60	1	Earl of Strafford.
	Monmouthshire	61	1	L. Foster Stedman.
	Norfolk	295	2	Capt. H. G. Buxton; Lord Hastings.
	Northamptonshire	179	1	F. H. Thornton.
	Northumberland	236	1	C. H. Sample.
	Staffordshire	204	1	W. W. Ryman.
	Worcestershire	139	1	John Walker.
	Yorkshire, N.R.	217	1	Major Clive Behrens.
	Scotland	273	2	Earl of Elgin; James Kilpatrick.
		— 3,436	— 23	
B.	Buckinghamshire	128	1	B. J. Gates.
	Devon	150	1	Sir J. F. Shelley, Bart.
	Durham	141	1	W. Burkitt.
	Essex	235	1	Sir Walter Gilbey, Bart.
	Herefordshire	145	1	Sir John R. G. Cotterell, Bart.
	Leicestershire	196	1	W. Lindsay Everard.
	London	422	2	John Bell; Sir A. G. Weigall.
	Nottinghamshire	195	1	Thomas Forshaw.
	Rutland	39	1	E. Guy Fenwick.
	Shropshire	282	2	Alfred Mansell; E. Craig Tanner.
	Suffolk	364	2	Major Norman Everett; Fred Smith.
	Surrey	193	1	R. Borlase Matthews.
	Wiltshire	165	1	Earl of Radnor.
	Yorkshire, W.R.	287	2	C. W. H. Glossop; Sir Harold Mackintosh.
	South Wales	86	1	Capt. H. A. Christy.
		— 3,028	— 19	
C.	Berkshire	200	1	H. A. Benyon.
	Cambridgeshire	150	1	S. Owen Webb.
	Cumberland	133	1	Joseph Harris.
	Glamorgan	58	1	Hubert Alexander.
	Gloucestershire	265	1	Major C. C. Hansford.
	Huntingdonshire	28	1	Lord Eltisley of Croxton.
	Kent	297	2	Thomas Neame; J. E. Quested.
	Lincolnshire	293	2	John Evens; Eustace Abel Smith.
	Oxfordshire	158	1	Robert Hobbs.
	Somerset	142	1	Lord Strachie.
	Sussex	330	2	Walter R. Burrell; Sir G. L. Courthope, Bart.
	Warwickshire	265	1	Col. C. J. H. Wheatley.
	Westmorland	75	1	Jacob Wakefield.
	Yorkshire, E.R.	99	1	T. L. Wickham-Boynton.
	Ireland	62	1	Edward Bohane.
	North Wales	214	1	Major W. Marshall Dugdale.
		— 2,769	— 19	
Foreign Countries		189		*Sir W. C. D. Dampier. *Col. Frank Garrett.
Members with no Addresses		17	5	*A. C. Nicholson. *E. C. Ransome.
Grand Totals		9,439	66	*Sir John Russell.

* Nominated Members of Council.

TABLE SHOWING THE NUMBER OF GOVERNORS AND MEMBERS IN EACH YEAR FROM THE ESTABLISHMENT OF THE SOCIETY.

Year.	President of the Year.	Governors.		Members.			Total.
		Life.	Annual.	Life.	Annual.	Honorary.	
1839	3rd Earl Spencer	—	—	—	—	—	1,100
1840	5th Duke of Richmond	86	189	146	2,434	5	2,860
1841	Mr. Philip Pusey	91	219	231	4,047	7	4,595
1842	Mr. Henry Handley	101	211	328	5,194	15	5,849
1843	4th Earl of Hardwicke	94	209	429	6,155	15	6,902
1844	3rd Earl Spencer	95	214	442	6,161	15	6,927
1845	5th Duke of Richmond	94	198	527	5,899	15	6,733
1846	1st Viscount Portman	92	201	554	6,105	19	6,971
1847	6th Earl of Egmont	91	195	607	5,478	20	6,391
1848	2nd Earl of Yarborough	93	186	648	5,387	21	6,335
1849	3rd Earl of Chichester	89	178	582	4,643	20	5,512
1850	4th Marquis of Downshire	90	169	627	4,356	19	5,261
1851	5th Duke of Richmond	91	162	674	4,175	19	5,121
1852	2nd Earl of Ducie	93	156	711	4,002	19	4,981
1853	2nd Lord Ashburton	90	147	739	3,928	19	4,923
1854	Mr. Philip Pusey	88	146	771	4,152	20	5,177
1855	Mr. William Miles, M.P.	89	141	795	3,838	19	4,882
1856	1st Viscount Portman	85	139	839	3,896	20	4,979
1857	Viscount Ossington	83	137	896	3,933	19	5,068
1858	6th Lord Berners	81	133	904	4,010	18	5,146
1859	7th Duke of Marlborough	78	130	927	4,008	18	5,161
1860	5th Lord Walsingham	72	119	927	4,047	18	5,183
1861	3rd Earl of Powis	84	90	1,113	3,328	18	4,633
1862	H.R.H. The Prince Consort 1st Viscount Portman	83	97	1,151	3,475	17	4,823
1863	Viscount Eversley	80	88	1,263	3,735	17	5,183
1864	2nd Lord Feversham	78	45	1,343	4,013	17	5,496
1865	Sir E. C. Kerrison, Bart., M.P.	79	81	1,386	4,190	16	5,752
1866	1st Lord Tredegar	79	84	1,395	4,049	15	5,622
1867	Mr. H. S. Thompson	77	82	1,388	3,903	15	5,465
1868	6th Duke of Richmond	75	74	1,409	3,888	15	5,461
1869	H.R.H. The Prince of Wales, K.G.	75	73	1,417	3,864	17	5,446
1870	7th Duke of Devonshire	74	74	1,511	3,764	15	5,438
1871	6th Lord Vernon	72	74	1,589	3,896	17	5,648
1872	Sir W. W. Wynn, Bart., M.P.	71	73	1,655	3,953	14	5,766
1873	3rd Earl Cathcart	74	62	1,832	3,936	12	5,916
1874	Mr. Edward Holland	76	58	1,944	3,756	12	5,846
1875	1st Viscount Bridport	79	79	2,058	3,918	11	6,145
1876	2nd Lord Chesham	83	78	2,164	4,013	11	6,349
1877	Lord Skelmersdale	81	76	2,239	4,073	17	6,486
1878	Col. Kingscote, C.B., M.P.	81	72	2,328	4,130	26	6,637
1879	H.R.H. The Prince of Wales, K.G.	81	72	2,453	4,700	26	7,332
1880	9th Duke of Bedford	83	70	2,673	5,083	20	7,929
1881	Mr. William Wells	85	69	2,765	5,041	19	7,979
1882	Mr. John Dent Dent	82	71	2,849	5,059	19	8,080
1883	6th Duke of Richmond and Gordon	78	71	2,979	4,952	19	8,099
1884	Sir Brandreth Gibbs	72	72	3,203	5,408	21	8,776
1885	Sir Massey Lopes, Bart., M.P.	71	69	3,356	5,619	20	9,135
1886	H.R.H. The Prince of Wales, K.G.	70	61	3,414	5,569	20	9,134
1887	Lord Egerton of Tatton	71	64	3,440	5,387	20	8,982
1888	Sir M. W. Ridley, Bart., M.P.	66	56	3,521	5,225	16	8,884
1889	HER MAJESTY QUEEN VICTORIA	73	58	3,567	7,153	15	10,866
1890	Lord Moreton	122	58	3,846	6,941	17	10,984
1891	2nd Earl of Ravensworth	117	60	3,811	6,921	19	10,928
1892	1st Earl of Feversham	111	69	3,784	7,066	20	11,050
1893	1st Duke of Westminster, K.G.	107	74	3,786	7,138	21	11,126
1894	8th Duke of Devonshire, K.G.	113	73	3,798	7,212	22	11,218
1895	Sir J. H. Thorold, Bart.	120	80	3,747	7,179	23	11,149
1896	Sir Walter Gilbey, Bart.	126	83	3,695	7,253	23	11,180
1897	H.R.H. The Duke of York, K.G.	126	88	3,705	7,285	24	11,228
1898	5th Earl Spencer, K.G.	121	79	3,687	7,182	25	11,094
1899	Earl of Coventry	116	75	3,656	7,009	23	10,879
1900	H.R.H. The Prince of Wales, K.G.	111	71	3,628	6,832	24	10,666
1901	3rd Earl Cawdor	102	70	3,564	6,338	27	10,083
1902	H.R.H. Prince Christian, K.G.	100	69	3,500	5,955	26	9,650
1903	H.R.H. The Prince of Wales, K.G.	99	62	3,439	5,771	27	9,398
1904	16th Earl of Derby, K.G.	96	68	3,375	5,906	32	9,477
1905	9th Lord Middleton	89	78	3,212	5,758	33	9,170
1906	Mr. F. S. W. Cornwallis	94	155	3,132	6,189	30	9,600

TABLE SHOWING THE NUMBER OF GOVERNORS AND MEMBERS IN EACH YEAR FROM THE ESTABLISHMENT OF THE SOCIETY—*contd.*

Year.	President of the Year.	Governors.		Members.			Total.
		Life.	Annual.	Life.	Annual.	Honorary.	
1907	Earl of Yarborough	91	174	3,076	6.299	29	9,669
1908	Duke of Devonshire	89	178	3,019	6.442	30	9,758
1909	7th Earl of Jersey, G.C.B.	91	177	2.931	6,696	31	9,946
1910	Sir Gilbert Greenall, Bart.	86	166	2,878	6,934	31	10,095
1911	HIS MAJESTY KING GEORGE V	85	168	2,805	7,191	30	10,279
1912	9th Lord Middleton	85	170	2,741	7,283	30	10,309
1913	2nd Earl of Northbrook	89	168	2,691	7,474	26	10,448
1914	Earl of Powis	89	173	2,626	7,629	28	10,545
1915	Duke of Portland, K.G.	88	184	2,517	7,313	28	10,130
1916	7th Duke of Richmond and Gordon, K.G.	83	185	2,427	7,526	27	10,248
1917	Mr. Charles Adeane, C.B.	93	210	2,412	8,214	26	10,955
1918	Hon. Cecil T. Parker	102	224	2,395	8,226	25	10,972
1919	Sir J. B. Bowen-Jones, Bart.	119	236	2,411	8,558	24	11,348
1920	H.R.H. The Prince of Wales, K.G.	129	256	2,402	9,208	25	12.020
1921	Mr. R. M. Greaves	137	275	2,374	10,098	24	12,908
1922	H.R.H. The Duke of York, K.G.	144	287	2,317	10,596	22	13,366
1923	Lt.-Col. E. W. Stanyforth	153	293	2,262	10,778	20	13,506
1924	Mr. Ernest Mathews, C.V.O.	159	289	2,201	10,676	21	13,346
1925	Sir Gilbert Greenall, Bart., C.V.O.	158	291	2,160	10,949	15	13,573
1926	Lord Desborough, G.C.V.O.	155	276	2,103	10,251	15	12.800
1927	Viscount Tredegar, C.B.E.	153	257	2,035	9,343	15	11,803
1928	Lord Harlech, C.B.	155	277	1.972	9,042	16	11,462
1929	Earl of Harewood, K.G.	154	273	1,914	8,813	16	11,170
1930	H.R.H. The Duke of Gloucester, K.G.	158	264	1.882	8,491	16	10,811
1931	Sir Arthur Hazlerigg, Bart.	153	245	1,823	8,036	16	10,273
1932	Lord Mildmay of Flete	144	223	1,774	7,501	13	9,655
1933	Duke of Devonshire, K.G.	140	212	1,707	7,367	13	9,439

STATEMENT made to the Council by the Chairman of the Finance Committee, on presenting the Audited Accounts of the Derby Show, 1933.

Mr. ADEANE said the Derby Show stood out as one of the best that the Society had ever held, and the result financially, although perhaps it did not come up to the most sanguine expectations, compared very favourably with that of the previous year. Then the Society had to record a loss on the Show of £7,802. This year it had a surplus of £1,394. It would be remembered that the first Show held after the new Charter and move from Park Royal was at Derby, and the profit then was £2,028. The "Royal" again visited Derby in 1921 and the profit was £9,621; that was a year of great prosperity for agriculture, whereas this year, although they were emerging from the slough of despond, there was still much way to make up. General depression and want of employment affected the Shows considerably, so that he thought they had every reason to be satisfied with the result obtained this year.

As compared with the Show at Southampton there was a general increase of receipts under nearly all the headings. Implements showed an increase of £2,216; Stock entry fees of £1,111, and Admissions to Showyard and Stand of £6,818.

The Derby Local Committee had made a generous contribution of £3,624 to Show expenses and had also given the Society the ground and provided gas and water.

The total expenditure at Derby was about the same as at Southampton although under the headings of Advertising and Prizes there was an increase of £969 and £1,461 respectively.

The financial result of the Show was that the Society were able to add to its Reserve the sum of £3,500, which was the amount allocated annually from the Ordinary Account against any loss on the Show, and carried forward the Show surplus of £1,394. As nothing was to be gained from money on Deposit it was proposed temporarily to invest that sum in a gilt-edged security so that it could be realized at any time if required.

It was customary on that occasion to make acknowledgments of the benefits received in connection with the Show, and first of all he was quite sure the Council would like to thank the President for all that he had done for them during the past year. (Applause.) They thanked him not only for what he had done during the past year, but for what he had always done for the Society. The visit of Their Majesties The King and Queen was a great encouragement, and contributed very largely to the success of the Show. Thanks were also due to the town and county of Derby, who gave the Society the warmest and most hospitable welcome. Last but not least, he wished to acknowledge the great services rendered by the Honorary Director, Mr. Burke, who with Mr. Turner and the Society's excellent staff, had laboured long and hard to make the Show a success.

STATEMENT OF RECEIPTS AND EXPENDI-

JULY 4 to

Receipts.

Corresponding figures for 1932. £		£	s.	d.	£	s.	d.
*5,216	Contribution from Derby Local Committee to Show Fund				2,000	0	0
1,927	Prizes given by Agricultural and Breed Societies and others	2,092	13	0			
* —	Contribution to Prizes from Derby Local Committee	1,624	0	0			
					3,716	13	0
	FEES FOR IMPLEMENTS, MACHINES AND MISCELLANEOUS EXHIBITS :—						
7,934	Exhibitors' payments for Shedding and Space	10,016	12	7			
200	Non-Members' Fees for entry of Implements, etc.	208	4	0			
60	Fees for entry of "New Implements"	185	0	0			
8,194					10,409	16	7
	FEES FOR ENTRY OF LIVE STOCK :—						
990	474 Members' Entries @ 3*l.*	1,422	0	0			
2,453	1,134 do. do. @ £2 10*s.*	2,835	0	0			
—	2 do. do. @ 2*l.*	4	0	0			
1,572	1,179 do. do. @ 30*s.*	1,768	10	0			
236	370 do. do. @ 1*l.*	370	0	0			
51	88 do. do. @ 15*s.*	66	0	0			
12	40 do. do. @ 10*s.*	20	0	0			
12	63 do. do. @ 5*s.*	15	15	0			
88	Entrance fees	86	3	0			
144	21 Non-Members' Entries @ 6*l.*	126	0	0			
210	33 do. do. @ 5*l.*	165	0	0			
72	32 do. do. @ 3*l.*	96	0	0			
30	4 do. do. @ 2*l.*	8	0	0			
11	9 do. do. @ 30*s.*	13	10	0			
33	43 do. do. @ 1*l.*	43	0	0			
1	2 do. do. @ 10*s.*	1	0	0			
3	8 do. do. @ 5*s.*	2	0	0			
7	*Local Classes*	–	–	–			
5,925		7,041	18	0			
6	*Less* :—Fees returned in connection with outbreaks of Swine Fever	12	0	0			
5,919					7,029	18	0
	FEES FOR ENTRY OF POULTRY :—						
79	Members :—359 Entries @ 4*s.*	71	16	0			
133	Non-Members :—625 Entries @ 6*s.*	187	10	0			
212					259	6	0
	OTHER ENTRY FEES :—						
108	Produce	94	7	0			
173	Horse-jumping Competitions	208	10	0			
39	Plantations Competition	29	16	0			
14	Orchards and Fruit Plantations Competition	18	0	0			
39	Butter-Making Competitions	41	0	0			
373					391	13	0
	CATALOGUE :—						
10	Extra lines for particulars of Implement exhibits	13	19	0			
2	Woodcuts of "New Implements"	3	10	0			
574	Advertising in Catalogue	717	18	0			
21	Sales of Implement Section of Catalogue	24	11	0			
457	Sales of Combined Catalogue	775	5	2			
34	Sales of Jumping Programmes	45	10	6			
1,098		1,580	13	8			
76	*Less* :—Expenses of Sales Superintendent and Assistants	94	17	4			
1,022					1,485	16	4
£22,863	Carried forward				£25,293	2	11

TURE OF THE SHOW AT DERBY,

JULY 8, 1933.

Expenditure.

Corresponding figures for 1932. £		£	s.	d.	£	s	d.
	COST OF ERECTION AND MAINTENANCE OF SHOWYARD:—						
3,544	Transferring Society's permanent buildings from Southampton to Derby (including taking down and re-erecting	2,999	18	9			
482	Fencing round Showyard	1,149	10	6			
1,676	Implement Shedding	1,900	6	1			
4,878	Stock Shedding	5,323	5	3			
390	Poultry and Produce Sheds	309	9	11			
597	Dairy	416	19	2			
115	Fodder Shed and Office	105	2	0			
105	Forestry Tent	98	16	6			
867	Grand Stand and Large Ring	773	8	2			
882	Various Offices and Stands	735	19	10			
185	Painting Signs and Fixing Ditto, Fencing and Judging Rings	326	3	0			
94	Insurance	90	13	9			
1,779	Hire of Canvas	2,162	5	3			
1,121	General Labour (including Society's Clerk of Works) and Horse Hire	1,034	6	6			
69	Bee Shed	62	17	9			
96	Horse-Shoeing Shed	87	10	6			
16,880		17,576	12	11			
37	Less: 74 Flagpoles £33/6/0; allowance re new timber £231/16/4; discount on special work £34/15/4	299	17	8			
16,843					17,276	15	3
	EXTRAORDINARY EXPENDITURE:—						
*2,465	*Rent of ground, cost of preparing and restoring same, and providing Gas and Water*				–	–	–
	SURVEYOR:—						
662	Salary, £500; Travelling and Hotel Expenses, £76 10s. 10d. Clerk, £10 10s.; Stationery and Sundry Expenses, £28 9s. 2d.				615	10	0
	PRINTING:—						
585	Printing of Prize Sheet, Entry Forms, Admission Orders, Circulars to Exhibitors, Prize Cards, Tickets, and Miscellaneous (including stationery)	595	2	3			
30	Programmes for Members	23	7	9			
877	Catalogue: Printing, binding and paper	759	6	10			
9	Catalogue: Carriage	12	9	7			
36	Awards Lists	45	10	0			
17	Programmes of Jumping Competitions	13	10	0			
1,554					1,449	6	5
	ADVERTISING:—						
175	Advertising Closing of Entries in Newspapers	186	13	10			
262	Advertising Show in Newspapers	471	13	1			
829	Billposting and Advertising Boards, etc.	927	0	6			
239	Printing and writing Posters, Window Cards, etc.	662	18	2			
—	Press Agent: Salary, duplicating, postage, etc.	226	3	4			
1,505					2,474	8	11
	POSTAGE, CARRIAGE, ETC.:—						
207	General Postage	132	9	10			
54	Postage of Badges to Members	52	3	9			
16	Carriage of Luggage, etc.	15	0	3			
277					199	13	10
	AMOUNT OF PRIZES AWARDED,						
10,372	(including £3,716 18s. 0d., given by various Societies and Derby Local Committee—per contra)				11,833	8	0
	COST OF FORAGE FOR LIVE STOCK:—						
986	Hay, £147 11s. 3d.; Straw, £414 2s. 2d.; Green Food, £164 2s. 7d.				725	16	0
	JUDGES' FEES AND EXPENSES:—						
543	Judges of:—New Implements, £27 8s. 11d.; Horses, £63 15s 7d.; Cattle, £163 3s. 6d.; Sheep, £162 17s. 11d.; Pigs, £65 2s. 2d.; Produce, £31 3s. 3d.; Goats, £5 1s. 6d.; Luncheons, £88				606	12	10
25	Badges for Judges and other officials				33	16	9
52	Rosettes				46	8	2
£35,284	Carried forward				£35,261	16	2

Corresponding figures for 1932. £	Receipts (contd.).	£	s.	d.	£	s.	d.
22,863	Brought forward				25,293	2	11
	MISCELLANEOUS RECEIPTS :—						
676	Admissions to Flower Show	1,067	6	9			
1,301	Motor Parks	1,217	9	0			
185	Rent for Railway Offices	92	10	0			
60	Premium for Cloak Rooms	65	0	0			
170	Rent for Ministry of Agriculture Pavilion	170	0	0			
213	Advertisements in Stock Prize Sheet	179	18	11			
4	*Bathchairs*	–	–	–			
28	Miscellaneous	22	10	1			
2,637					2,814	14	9
	ADMISSIONS TO SHOWYARD :—						
555	Tuesday, July 4, @ 5*s.*	746	4	0			
1,541	Wednesday, July 5, @ 5*s.* and 3*s.*	3,821	16	0			
1,705	Thursday, July 6, @ 3*s.*	3,802	17	11			
1,447	Friday, July 7, @ 2*s.* 6*d.*	1,606	7	6			
684	Saturday, July 8, @ 1*s.*	1,430	0	3			
87	Season Tickets	111	7	2			
312	Day Tickets	1,035	10	0			
6,331					12,554	2	10
	ENTRANCES TO STAND AT HORSE RING :—						
181	Wednesday, July 5	298	15	3			
172	Thursday, July 6	253	12	6			
166	Friday, July 7	183	4	0			
122	Saturday, July 8	246	2	0			
525	Tickets sold for Reserved Enclosure	779	1	0			
1,166					1,760	14	9
118	Sales of Produce at Dairy				117	16	10
10	Outstanding Receipts in respect of Southampton Show				4	3	0
33,125					42,544	15	1
7,802	*Debit Balance*				–	–	–
£40,927					£42,544	15	1

*NOTE.—The contribution of the Southampton Local Committee to the Show Fund represented the balance of the Local Fund (after deducting expenses of collection); and was intended to cover, as far as possible, the usual contributions made by Local Committees for Prizes, etc., and the cost of the provision and preparation of the Showground.

Examined, audited, and found correct, this 6th day of November, 1933.

T. B. TURNER, Secretary.

PRICE, WATERHOUSE & CO..

Corresponding figures for 1932. £	Expenditure (*contd.*).	£	s.	d.	£	s.	d.
35,284	Brought forward				35,261	10	2
	GENERAL ADMINISTRATION :—						
170	*Honorary Director* :—Travelling, Entertaining, etc.	184	10	1			
80	*Stewards of Stock, Hospitality and Implements* :—Personal and Railway Expenses, etc.	106	12	9			
186	*Assistant Stewards of Stock* :—Personal and Railway Expenses	187	15	11			
376	*Official Staff* :—Extra Clerks, £108 4*s.* 11*d.*; Lodgings, £54 8*s.* 11*d.*: Maintenance of Staff, £68 0*s.* 5*d.*; Travelling Expenses, £9 2*s.* 1*d.*; Secretary's Hotel and Travelling Expenses, £125 6*s.* 8*d.*	365	2	7			
235	*Finance Office* :—Stewards, £23 4*s.* 8*d*; Finance Clerk, £10 10*s.*; Grand Stand Men, £59 1*s.* 11*d.*; Turnstile Men, £75 19*s.* 9*d.*; Bank Staff, £54 0*s.* 6*d.*; Refreshments, £12 18*s.* 7*d.*; Hire of Car, £18	253	15	5			
78	*Awards Office* :—Clerks, £64 4*s.* 5*d.*; Boys, £15.	79	4	5			
1,125					1,177	1	2
	General Management :—						
166	Foremen and Assistant Foremen	140	19	11			
69	Yardmen	64	18	10			
152	Door and Gate Keepers	199	15	1			
29	*Motor Parks* :—Tents, Offices, etc.	34	9	2			
117	*Veterinary Department* :—Veterinary Inspectors	108	8	6			
130	*Engineering Department* :—Consulting Engineer	154	10	9			
481	*Police* :—Borough Police, £364 1*s.*; Commissionaires, £20 7*s.* 11*d.*	384	8	11			
1,144					1,087	11	2
788	*Dairy* :—Steward and Assistant Stewards, £88 8*s.* 3*d.*; Staff, £227 2*s.*; Milk, £242 8*s.* 6*d.*; Ice, £33 2*s.* 6*d*; Utensils, £78 5*s.* 8*d.*; Engine and Engineers, £133 1*s.*; Labour, £28 10*s.* 8*d.*; Butter and Cheese Boxes, £3 18*s.* 8*d.*; Refreshments, £29 11*s.* 3*d.*; Fuel, £2 17*s.* 3*d.*; Miscellaneous, £22 11*s.* 4*d.*	889	16	8			
10	*Analysis of Cider*	8	10	0			
126	*Poultry* :—Penning and Feeding, £48 12*s.*; Cartage, £20 7*s.* 3*d.*; Judges, £29 7*s.* 3*d.*; Superintendent, £19 16*s.* 9*d.*	118	3	3			
924					1,016	9	11
686	*Flower Show* :—Steward and Assistant, £37 19*s.* 2*d.*; Manager, £56; Hire of Tents, etc., £414 0*s.* 7*d.*; Judges, £16 13*s.* 10*d.*; Medals, £23 8*s.* 10*d.*; Labour and Miscellaneous, £84 19*s.*; Carriage and Cartage, £14 4*s.* 11*d.*				647	6	4
83	Plantations Competition				76	14	5
100	Orchards and Fruit Plantations Competition				76	9	5
143	Forestry (excluding Tent)				133	7	9
394	"Musical Ride"				486	14	9
	GENERAL SHOWYARD AND MISCELLANEOUS EXPENSES :—						
170	Band	241	17	6			
198	*Hire of Furniture*	—	—	—			
11	Telephones and Call Boxes	18	5	0			
39	Telegraph Facilities	11	0	0			
56	Official Luncheons	51	11	2			
54	St. John Ambulance	73	17	9			
14	Billposting in Showyard	—	—	—			
14	Medals	28	6	8			
38	Engraving and forwarding Cups	43	13	8			
21	Plans, Blocks and Maps	26	15	0			
10	Tan	8	5	0			
144	Sleepers	165	7	0			
29	Hire of Tents and Marquee	28	17	6			
37	Weighbridge: Carriage and Erection Charges	19	15	11			
33	Testing New Implements for Silver Medal and cost of Medals	63	15	3			
111	Miscellaneous	116	13	4			
44	Gas, Electric Light, Coal and Firewood	21	6	6			
6	*Bathchairs*	—	—	—			
—	Pit Pony Boys	25	5	0			
—	Film of Show	187	1	4			
—	Hunting Pageant	65	1	4			
—	Economic Conference Delegates and South African Party	44	11	8			
1,029					1,186	6	7
15	Outstanding accounts in respect of Southampton Show				1	0	8
40,927					41,150	12	2
—	Credit balance				1,394	2	11
£40,927					£42,544	15	1
	Credit balance (as above)				£1,394	2	11
	Add :—Contribution from Ordinary Account to Show Fund				3,500	0	0

Proceedings at General Meeting of Governors and Members

HELD IN THE LARGE TENT IN THE DERBY SHOWYARD.

THURSDAY, JULY 6th, 1933.

THE DUKE OF DEVONSHIRE, K.G. (PRESIDENT) IN THE CHAIR.

Congratulations to Their Majesties.

The PRESIDENT said that before proceeding with the business of the meeting, he was sure it would meet with the approval of all Members of the Society that they should send the following message to His Majesty The King :—

> Resolved that this the General Meeting of Governors and Members of the Royal Agricultural Society of England assembled in the Showyard desire to convey to Their Most Gracious Majesties The King and Queen their sincere and hearty congratulations upon the occasion of the 40th anniversary of their Wedding.

The proposition was carried by acclamation.

The PRESIDENT, proceeding, said that, as probably all present were aware, this was the fifth Royal Show to be held at Derby. The others were in 1843, 1881, 1906 and 1921. Derby now had a similar record to Newcastle-upon-Tyne in having entertained the Show on five occasions.

The site of the Show, arranged for by the Corporation of Derby with the goodwill of the London Midland and Scottish Railway, the National Playing Fields Association, and others, was the same as that occupied in 1906 and 1921, but the area had been contracted and the ground laid out in a more compact manner which was for the benefit of Exhibitors and the Visitors alike.

The Town and County of Derby had worked together in the most amicable and enthusiastic way to collect the Local Fund and their efforts had been well rewarded by a generous response on the part of the residents for a sum of over £7,000 had been received. Much of this was expended on the preparation of the site, the laying on of gas, water, electricity, etc., but he, as President, hoped that there would be quite a substantial balance that could be handed over to the Society at the conclusion of the Show.

In that connection he would be failing in his duty if he did not express his personal thanks and the thanks of the Council to the Mayor and his energetic team of helpers—(applause)—for all they had done, but the meeting would shortly be asked to approve of a special resolution expressing their gratitude.

Many of those present would remember the last two Shows of 1906 and 1921, which were most successful and all would earnestly hope those successes would be repeated on the present occasion. In 1881 a profit of £4,500 was made and the attendance was nearly 128,000; in 1906 a profit of £2,000 odd with an attendance of nearly 120,000; and in 1921 there was a profit of nearly £9,600 and an attendance of almost 126,000.

Weather, too, had usually been kind to the visit of the Royal Agricultural Show to Derby, for in 1881 the Steward of Live Stock reported bright sunshine and not a cloud in the sky from the opening morning until the end of the Show, and most of them would remember the brilliant weather during the 1921 Show. He thought that on the present occasion they might congratulate themselves on a similar record.

To all Exhibitors the Society was indebted for the wonderful Show at Derby. Farming was going through a very difficult time in all its branches and Exhibitors had to think twice before sending in their applications and entries. To the Exhibitors in both the Implement and Machinery Section, embracing as it did so many different sides of the industry, and to the Live Stock Exhibitors also, he tendered the thanks of the Council for their unfailing support.

Turning to the Live Stock Section, might he illustrate the progress made in the ninety years' interval between the 1843 Show and the present Show by troubling them for a moment with figures. In 1843 the Catalogue provided for only 2 Breeds of Horses, 3 distinct breeds of Cattle, 3 breeds of Sheep and 2 breeds of Pigs. This year's Catalogue contained a Classification for 7 breeds of Horses, 20 breeds of Cattle, 24 breeds of Sheep, and 11 breeds of Pigs, and they had gone a step further this year and included classes for Commercial Bacon and Pork Pigs, so that those interested might have a practical demonstration by seeing the prize-winners of the type of animal to breed for these purposes.

Many factors made for the success of the Show. As in 1921 the Society were happy indeed to be honoured with a visit of His Majesty The King, and still more honoured that this year he was accompanied by the Queen.

Then there had been no difficulties as in 1921 owing to the stoppage of work in the mines, restricted Rail Services, and constant outbreaks of Foot and Mouth Disease, the latter always a menace to any Agricultural Show.

Railway and Transport Companies helped considerably in carrying the Exhibits, Live Stock and Passengers to and from the Show, and it was interesting to recall that the Local Committee appointed for the 1843 Show reported to the Council that the Directors of the Midland Counties Railway then undertook to supply any number of special trains, liberally proposing—in the words of the report—to receive only half fares for Cattle and Farming Implements and no advance on the usual fares for Passengers.

Although there were two more days to go, he thought they might congratulate themselves on a very successful Show—(" hear, hear "). He was acting in a dual capacity as President of the Society and also of the Local Committee and closely identified with the County and Borough of Derby. He thought they might congratulate themselves on a mutual success. He trusted that all visitors and exhibitors would retain pleasant and happy recollections of their visit to Derby this year—(applause).

Mayor, Corporation and Local Committee Thanked.

Mr. U. ROLAND BURKE (Hon. Director) proposed, " That the best thanks of the Society are due and are hereby tendered to the Mayor and Corporation of Derby and the Local Committee for their cordial reception of the Society and their efforts to promote the success of the Show." He felt it a great privilege to be asked to propose this vote of thanks; living in the County, he had necessarily been in close association with the Mayor and Corporation and all those who had helped the Society. As anyone knew who had anything to do with " the Royal ", the success of the Show largely depended on the efforts of the Mayor and the Local Committee of the place visited. In Derby they had been most happily situated. From the moment when the visit of the Show to the borough was contemplated, three successive Mayors had thrown themselves heart and soul into the preparations. Alderman W. H. Hoare began the preliminary work in 1931, followed by Alderman W. H. Salisbury and the present Mayor (Alderman A. E. Moult).

Nothing he could say would adequately express what they would like to say to the Mayor for all that he had done. He had been backed up most cordially by Members of the Corporation and by his splendid army of officials. In Derby they had had some very good friends who had helped the Society in every possible way and the working of the Show had been an easy task. He wished gratefully to acknowledge all that had been done. The County had been divided into districts with area committees, and the idea had proved very successful. It was impossible, of course, to mention everyone, but he wished in particular to thank Capt. Evan Baillie (Joint Hon. Treasurer of the Local Committee), who had worked as hard as anybody to make the Show a success and in collecting the substantial sums raised in the County of Derby.

Whatever the financial result of the Show might be, everyone locally would always be able to look back and say that they had done everything possible for its success.

Mr. **Burke** concluded by expressing his personal thanks to everyone in Derby and the County for giving him such splendid support. (Applause.)

Lord **Hastings** said it was his privilege to second the motion. As a visitor himself to Derby he did most heartily support all Mr. Burke had said. The standard of performance must always be judged by results, and Wednesday was surely evidence of the cordiality which was extended to the Society by the Mayor, Corporation and people of Derby. The visit of T. M. The King and Queen was a day likely to remain long in the memories of visitors to the 1933 Royal Show. The atmosphere was redolent of the Spirit of Welcome.

The Members of the Society congratulated Derby on the success of its own efforts.

The resolution was enthusiastically carried.

The **Mayor of Derby**, on behalf of the Corporation and the citizens of Derby, responded to the vote of thanks. It had, he said, been a personal pleasure to him to do what he could for the Show and the work had been an equal pleasure to Ald. Hoare and Ald. Salisbury. Members of the Corporation had also co-operated most loyally and enthusiastically. Everyone had done his best to make the Show a success.

It was hoped that there would be a surplus on the local fund to hand over to the Society. A sum of £7,500 had been raised and he was naturally very proud that nearly half of it was contributed from the borough of Derby. They had done remarkably well to raise that sum having regard to the difficult times. The same results as 12 years ago could not be expected, but bearing in mind the attendances on Tuesday and Wednesday he thought they had every reason to be satisfied.

Derby was always pleased to do its best for the Royal Agricultural Society's Show. (Applause.)

Capt. the Hon. G. **Evan Baillie** asked to be allowed to join with the Mayor in thanking Mr. Burke and Lord Hastings for their very kind words about the Local Committee. As Hon. Treasurer, he said, he owed a deep debt of gratitude to the conveners of the various areas in the County and all who had worked so hard. Not a single area had given his colleague or himself the slightest anxiety. The Mayor of Derby had worked " like a black ", with most satisfactory results. The President had attended a great many meetings in order to help in the raising of funds and had been of the greatest assistance. Mr. Burke, in addition to his other duties, had taken over the Bakewell area and had been instrumental in raising between £500 and £600.

Thanks to Railway Staffs.

Sir **Merrik Burrell** moved : " That the best thanks of the Society are due and are hereby tendered to the Staff of the London Midland and Scottish and London and North Eastern Railway Companies for all the work they have done in handling so expeditiously the traffic to the Show."

It gave him great pleasure, he said, to propose this resolution because as an exhibitor of horses and cattle for the past 30 years he knew only too well the debt of gratitude they owed to the Staffs of the Railway Companies for the efficient way in which they handled the large numbers of exhibits. Only those who were in close touch with the work of the Superintendents and men hour after hour and day after day knew what a great strain was put upon them. Weeks of arrangement were necessary to ensure the great volume of stock being brought to the Show and taken away successfully. An enormous tonnage of implements and trade exhibits had also to be dealt with. Therefore, in proposing this vote of thanks he was moving a resolution with a real note of gratitude behind it to the men who worked extremely hard in the interests of the Show.

Col. C. J. H. WHEATLEY, in seconding the motion, endorsed every word Sir Merrik Burrell had said.

The resolution was carried unanimously.

Members' Suggestions.

The PRESIDENT then enquired if any Governor or Member had any remarks or questions to put forward. He would not undertake to answer them on the spur of the moment, but any suggestion made now would receive the attention of the Council when they had a little more time to think over it.

Capt. E. L. HUGHES said he had a suggestion to make with regard to stockmen. He thought those who exhibited owed a debt of gratitude to their stockmen and it was their job, if they could, to look after the men's interests. Previous to the actual opening they were able to get what they wanted from the Y.M.C.A. tent at pretty reasonable prices, but not when the Show was opened. Some of the men had told him of their experiences. One party of men told him that they went down to the stockmen's bar at 9.30 on Monday evening; they wished to purchase some sandwiches. The people in charge would not serve them with sandwiches. Another party went down at lunch-time and wished to purchase tea and coffee, but this was refused them. So that he thought the arrangements for these men were not satisfactory and he hoped the Council would be able to do something in the matter.

Thanks to the President.

Mr. A. W. STANTON proposed a hearty vote of thanks to the Duke of Devonshire for his services in the Chair at that meeting. What his Grace had done for the Royal Agricultural Society was known to all those present and he asked them to pass the resolution with acclamation.

Mr. F. L. GOOCH, in seconding the motion, recalled that when quite a young official and not knowing his Grace, he thought he had been rather discourteous to him; but on tendering an apology the next morning his Grace complimented him on being a servant of the Society who had his job to do and did it.

The vote of thanks was passed with acclamation.

The DUKE OF DEVONSHIRE, in replying, said he would always look back on his Presidency and the visit of the Society with the happiest of recollections. He had always been proud to be identified with Derby and Derbyshire, and having had the privilege of driving through the borough with the King and Queen on the previous day he had more reason than ever to be grateful and proud of what Derby was doing. He would like specially to mention the admirable exhibit at the Show arranged by the Derby Chamber of Commerce. He had first-hand knowledge for saying how pleased Their Majesties were with their visit to it.

He, as President, wished to thank everyone—whether in Derby or outside—who had worked to make the Show the success it undoubtedly had been.

Some of those present might not see another Royal Show in the Borough of Derby, but no doubt their successors would in the future welcome the Royal Agricultural Society again. When they did the 1933 Show would be one for them to go by and to better. All would agree that it would provide a very good example.

Proceedings at the Annual General Meeting of Governors and Members

HELD AT THE ROYAL AGRICULTURAL HALL, ISLINGTON, LONDON, N.

WEDNESDAY, DECEMBER 6, 1933.

THE DUKE OF DEVONSHIRE, K.G. (PRESIDENT), IN THE CHAIR.

The PRESIDENT, who was greeted with applause, said: My Lords, and Gentlemen, I see the first item on the agenda is "The Chairman's Opening Remarks", but, as this is a formal business meeting and there is a great deal of business to be transacted, and as I dare say a great many of you are in rather a hurry to see the Show and possibly to get away from this rather cold and dark room, I propose that we proceed right away with the business of the meeting.

The Balance Sheet for 1932 and the Accounts for the Derby Show are in your hands, and the Annual Report of the Council has been printed and circulated to each member. I therefore propose that they be taken as read. Is that your pleasure? (Agreed.)

Adoption of Report.

Mr. W. KERRIDGE (East Harling): My Lords and Gentlemen, I have very great pleasure in moving the adoption of the Report, which has been circulated. I think it is a most admirable Report. The Derby Show seems to have produced a very fine profit, and we East Anglians are all looking forward to the Show at Ipswich next year. ("Hear, hear" and applause.) The Agricultural Associations of East Anglia are doing their best to make that Show a great success. Each of those Associations, the Norfolk, the Suffolk and the Essex, has given a handsome contribution to the local fund of £500, and I do not think there is any question that we shall have a very great Show at Ipswich next year.

Mr. L. K. OSMOND (Grimsby): My Lords and Gentlemen, I have much pleasure in seconding the motion. You have only to read through the Report to realize how much this Society is doing for the benefit of agriculture in all its branches. I am sure we all hope that the Ipswich Show will be a great success.

I want to be very brief in seconding this resolution, but before I sit down I would venture to make the suggestion that the Council of this Society should back up the resolution which was proposed at the meeting of the Smithfield Club yesterday with regard to the excessive imports of foreign meat. I think it would be a great pity if the old breeds of cattle of this country were allowed to die out. They have been the pride and glory of this country, and I am sure that, if a vote were taken on the subject, we should all with one voice express our desire that something should be done to put the production of beef on at least a paying and an economic basis. ("Hear, hear" and applause.)

The PRESIDENT: The resolution for the adoption of the Report of the Council has been moved and seconded, and I will now put it to the meeting.

The resolution was carried unanimously.

Election of President.

The PRESIDENT: The next business is the election of the President for the year 1934. As you will see from the Report, the Council have decided to recommend that the Earl of Stradbroke should be elected as President of the Society for the ensuing year, and I have great pleasure in asking Mr. Adeane to move that resolution. (Applause.)

Mr. CHARLES ADEANE: My Lords and Gentlemen, I have the greatest pleasure in moving that Lord Stradbroke be elected President of this Society for the coming year.

I am especially pleased to move the resolution for two reasons. One is that Lord Stradbroke is a very old friend of my own and I am proposing him for the greatest honour which agriculture has to bestow. The second reason is that I know Lord Stradbroke has all the qualifications which are necessary for the office of President of this Society. ("Hear, hear.")

It is quite unnecessary for me to relate all the duties which Lord Stradbroke has performed in his lifetime or the offices which he has held. One must leave something to the imagination, and I imagine that Lord Stradbroke has been reared on Red Poll milk, clothed with Suffolk wool, fattened on Suffolk lard and taught to ride on a Suffolk punch. (Laughter.) I think that is a good nurturing for a Suffolk man, and Lord Stradbroke is a very fine Suffolk man. Whether at home in his own county or in the Dominions or when he was at the Ministry of Agriculture, Lord Stradbroke has done his utmost for agriculture. ("Hear, hear.") In his own county he is well known as a distinguished and successful breeder of stock, especially Red Polls and Suffolk punches. When he was in Australia he did a great deal to popularize all British breeds, and when he was at the Ministry of Agriculture he helped as much as anyone in the formation of that valuable institution, the Quarantine Station.

Now that at long last—this is not the first time that Suffolk has invited the Society—we are going to Ipswich, with Lord Stradbroke at our head, I am sure there is no doubt that we shall have a successful Show. (Applause.)

The PRESIDENT: I will ask Lord Mildmay to second the resolution.

Lord MILDMAY OF FLETE: My Lords and Gentlemen, it gives me the greatest pleasure to second this proposition, and I do so with the utmost confidence, for I have known Lord Stradbroke intimately from the days when we were at Cambridge and enjoyed ourselves together. Since those far-off days, Lord Stradbroke has been prominent in the more serious things of life. He has served the State. He has represented His Majesty the King overseas with conspicuous success. He has shown, if I may be allowed to say so, that he is most capable and most tactful in the management of men, and most efficient and most conscientious in all that he undertakes. ("Hear, hear.") Those qualities which have compelled the respect and the regard of all with whom he has been brought into contact in the past will be quite invaluable to us, the Royal Agricultural Society of England, in the year that lies before us. ("Hear, hear.") It is especially satisfactory to think that all his life Lord Stradbroke has done his very utmost to promote the well-being of agriculture. There is no more popular man in the eastern counties of England. (Applause.) With our Ipswich Show before us, Lord Stradbroke's leadership will be welcome to all throughout those districts and is likely to ensure an outstanding success for our Show. (Applause.)

The CHAIRMAN: It has been moved and seconded:—

> **"That the Earl of Stradbroke, K.C.M.G., be elected President of the Society to hold office until the next ensuing Annual General Meeting."**

I will put that resolution to the meeting.

The resolution was carried with acclamation.

Lord STRADBROKE, who was greeted with applause on rising to reply, said: My Lord Duke, my Lords and Gentlemen, I am fully sensible of the very great honour that you have just conferred upon me, in electing me as your President. I think that, as Mr. Adeane said, the greatest honour that agriculturists can pay to a fellow agriculturist is to elect him President of this Society, and I thank you all very much and appreciate the confidence you have placed in me. I must also say that the pleasure I feel at being elected has been greatly added to by the fact that the resolution was proposed and seconded by two such very old friends of mine, who have always taken a very prominent part in agriculture and in your counsels, and whose friendship with me I may claim dates back well into the last century.

I am succeeding a President who has been most successful, and I shall be in a rather difficult position in trying to follow in his footsteps. We all regret his retirement, but, according to the Charter and Bye-laws of the Society, no one is allowed to hold the position of President for two years. I am sure everybody here would be very glad if the noble Duke could occupy the position again for the following year. (Applause.)

With regard to the Show at Ipswich, I feel sure that everything that is possible will be done to make it a success. Reference has already been made to what is being done there and to the good spirit that exists.

My fear is as to myself, because I have not had the experience of the noble Duke in presiding over your counsels. Although I have been a member of this Society for forty-five years, I have never had the honour of serving on the Council. I feel sure, however, that I can always rely on your indulgence and on your assistance in carrying out any duties that may fall to my lot, because we shall all be working for one object, namely, the object of making this Society what it always has been, the leading Society of Agriculture of the world and the Society that gives the very greatest assistance to agriculture, especially in this country.

The Society has not honoured Ipswich before by holding its Show there, but in the early days, so far back as 1840, it visited Cambridge, and visited that town again in 1894 and in 1922. The Society went to Norwich in 1849, in 1886 and in 1911. Chelmsford also was honoured by a visit in 1856 and Bury in 1867, but our invitation to you to visit Ipswich in 1907 was not acceptable to you, and, in spite of all our blandishments, you thought fit to go elsewhere. I think that perhaps the results proved you were wise in your decision, because you went to Lincoln and made a profit at that Show of £5,000. We shall be very glad if we can approach anything like that figure at Ipswich; I am afraid that may be rather more than we can manage. However, there is no doubt that there is a great deal of enthusiasm in the eastern counties about your visit to Ipswich. At our inaugural meetings we formed excellent committees for the collection of subscriptions, and it is very gratifying to find that the neighbouring counties of Norfolk and Essex have joined with Suffolk in withholding their Shows; all three Societies are working together most cordially to make the Ipswich Show a success in every way. You may be quite sure, too, that the three Societies of the breeds for which East Anglia is so famous—the Suffolk Horse, the Suffolk Sheep and the Red Poll Societies—are all doing their very best to increase the value of the prizes offered, and I think we may be quite sure that there will be an excellent exhibition of those three breeds of animals. I have no doubt that the Societies of the other breeds throughout the country will also come forward in their usual generous way to support the Society. We also feel in our own district that we should not be able to increase our prize-list in the way we are increasing it if it were not for the very generous support given by your Society. Amongst the various classes at the Show, we shall be able to offer prizes for teams of four horses—four Suffolks, four Shires or four Percherons, as the case may be. I think that will add interest to the Show and will at any rate remind the general public that the horse is not altogether knocked out of it. ("Hear, hear" and applause.) An egg-laying competition is now going on, which will be, I think, of interest to all poultry keepers. Poultry keeping is becoming more and more an important industry throughout the country. Very careful tests are being made, and it will be possible for everybody to see at the Show what each hen produces during the year and the advantage to be gained by having certain classes of hens on certain classes of land.

In proposing my election as President, Mr. Adeane referred to the Quarantine Station, at the opening of which I had the honour of moving a vote of thanks, on behalf of the Ministry of Agriculture, to your Society for undertaking the task of managing the Station. It came as a great blow to all of us, I think, when we heard of the probability of the Quarantine Station being closed down. We all realize what very fine work it has done. During the five years that it has been open, some 2,500 animals—cattle, sheep, pigs and goats—have passed through it, of a value of over £162,500. We know that, if the Quarantine Station had not been in existence, those animals would not have been exported, or anyhow a very large proportion of them would not have been exported, and I do think it is most important that every effort should be made to keep that Station open. ("Hear, hear.") I hope most sincerely that the Ministry of Agriculture will do what Sir Merrik Burrell asked them to do when he spoke on your behalf at the opening ceremony, that is, take charge of the Station, because I feel that the fact of the Government controlling it would carry great weight with our Dominions overseas. ("Hear, hear.") They would feel that everything was being done in the best possible way, and it would have all the weight of the Government behind it. The expense is not the important matter; the important matter is to have the support of the Government, and I think we should aim at that.

Suffolk and Ipswich want to welcome this Society, not merely because we are very, very proud to have the Show held at Ipswich, but because we all realize how much this Society does for agriculture in general. You have your Benevolent Fund and your Research Department, and you protect farmers from being imposed on by enabling them to send their artificial manures and feeding stuffs for analysis. You do so much for agriculture that we wish in every way to help the Society as well as to make the Show a success. I think there is no doubt that there will be a most successful Show and exhibition of stock and of implements. More ground has been applied for by the manufacturers of implements for the purpose of exhibiting their various products than has been the case for some time. I was going to say that the only fear we have is as to the number of people who will attend the Show, but I think sufficient attractions will be provided to ensure a large number coming, and, with the generous support that has been given to the fund for the Show, I think we may anticipate that, if there is not a large profit, at any rate there will be no loss. I sincerely trust that the Show will be such a success that you will have no regrets at having accepted our invitation to come to Ipswich.

Once again, my Lord Duke, my Lords and Gentlemen, I thank you very sincerely for the very great honour you have done me in appointing me your President for the coming year. (Applause.)

Election of Trustees.

The PRESIDENT: The next business on the agenda is the election of the Trustees. It is usual for the Trustees to be elected by a show of hands. The names of the present Trustees, who are, under Bye-law 141, recommended by the Council for re-election, are printed in List "A" on the agenda paper, and I will now ask you to signify in the usual manner whether it is your pleasure that these twelve noblemen and gentlemen should be elected Trustees of the Society to hold office until the next ensuing Annual General Meeting.

The Trustees, whose names are as follows, were duly elected:—

H.R.H. The Prince of Wales, K.G., York House, S.W.1.
H.R.H. The Duke of York, K.G., 145 Piccadilly, W.1.
H.R.H. The Duke of Gloucester, K.G., Buckingham Palace, S.W.1.
Charles Adeane, C.B., Babraham Hall, Cambridge.
Duke of Bedford, K.G., Woburn Abbey, Bedfordshire.
Lord Cornwallis, Linton Park, Maidstone, Kent.
Percy Crutchley, Sunninghill Lodge, Ascot, Berkshire.
Lord Daresbury, C.V.O., Walton Hall, Warrington.
Duke of Devonshire, K.G., Chatsworth, Bakewell, Derbyshire.
Lord Harlech, C.B., Brogyntyn, Oswestry, Shropshire.
Sir Arthur Hazlerigg, Bart., Noseley Hall, Leicestershire.
Lt.-Col. E. W. Stanyforth, C.B., Kirk Hammerton Hall, York.

Election of Vice-Presidents.

The PRESIDENT: The next business is the election of Vice-Presidents. I will ask you to signify by show of hands whether it is your pleasure that the present Vice-Presidents, whose names are printed in List "B", should be re-elected to hold office until the next ensuing Annual General Meeting.

The Vice-Presidents were duly elected as below:—

Rev. C. H. Brocklebank, Westwood Park, West Bergholt, Essex.
Sir Merrik R. Burrell, Bart., Floodgates, West Grinstead, Horsham.
Earl of Derby, K.G., Knowsley, Prescot, Lancashire.
Lord Desborough, K.G., Taplow Court, Maidenhead.
R. M. Greaves, Wern, Portmadoc, North Wales.
Earl of Harewood, K.G., Harewood House, Leeds.
William Harrison, Albion Iron Works, Leigh, Lancashire.
Lord Mildmay of Flete, Flete, Ermington S.O., Devon.
Duke of Portland, K.G., Welbeck Abbey, Worksop, Notts.
Earl of Powis, Powis Castle, Welshpool, Mont.
Viscount Tredegar, C.B.E., Tredegar Park, Newport, Mon.
Earl of Yarborough, Brocklesby Park, Habrough, Lincolnshire.

The PRESIDENT: I will now ask Mr. Gooch to move the election of the Auditors.

Election of Professional Accountants and Auditors.

Mr. F. L. GOOCH: My Lord Duke, my Lords and Gentlemen, I have great pleasure in proposing that Messrs. Price, Waterhouse & Co. be elected as Professional Accountants and Auditors of the Society's accounts for the ensuing year.

Mr. JAMES HAMILTON: My Lord Duke, my Lords and Gentlemen, I have great pleasure in seconding that resolution.

The resolution was carried unanimously.

Elections to the Council.

The PRESIDENT: I have to inform you that under the Bye-laws the requisite measures have been taken to fill the vacancies on the Council in the representation of the Districts in Group "C".

As Chairman, I have now formally to report to the Annual General Meeting the names and addresses of the Ordinary Members of the Council who have been elected by the several Divisions, in order that the meeting may, in the words of the Bye-law, "take cognisance of their election". This duty I formally fulfil by placing before you List "C", on pages 3 and 4 of the printed agenda paper, in which the names of the newly-elected Members are specially marked. Additional Members of Council have also been elected for Derby, Norfolk and Suffolk.

Cumberland: Joseph Harris, Brackenburgh Tower, Penrith.
Westmorland: Jacob Wakefield, Sedgwick House, Kendal.
Yorks (East Riding): T. L. Wickham-Boynton, Burton Agnes Hall, Driffield.
North Wales: Major W. Marshall Dugdale, D.S.O., Llwyn, Llanfyllin, Mont.
Lincoln: John Evens, Burton, near Lincoln, and Eustace Abel Smith, Longhills, Lincoln.
Huntingdon: Sir Douglas Newton, K.B.E., M.P., Croxton Park, St. Neots.
Cambridge: S. Owen Webb, Streetly Hall, West Wickham.
Oxford: Robert Hobbs, Kelmscott, Lechlade.
Kent: Thomas Neame, The Offices, Macknade, Faversham, and J. Egerton Quested, The Firs, Cheriton, Folkestone.
Warwick: Col. C. J. H. Wheatley, Berkswell Hall, Coventry.
Gloucester: Major C. C. Hansford, Watts Barn, Codrington, Chipping Sodbury.
Glamorgan: Hubert D. Alexander, The Croft, Sully, near Cardiff.
Somerset: Lord Strachie, Sutton Court, Pensford.
Berkshire: Henry A. Benyon, Ufton Court, near Reading.
Sussex: Walter R. Burrell, Knepp Castle, Horsham, and Col. Sir George L. Courthope, Bart., M.C., M.P., Whiligh.
Ireland: Edward Bohane, C.B.E., Simmons Court House, Donnybrook, Co. Dublin.

Derby: Sir Ian Walker, Bart., Osmaston Manor, Derby.
Norfolk: Capt. H. G. Buxton, Cokesford Farm, Tittleshall, King's Lynn.
Suffolk: Major Norman Everett, Rushmere, Ipswich.

Members' Suggestions.

The PRESIDENT: I have now to enquire whether any Governor or Member has any remark to make or question to ask or suggestion to offer which may be referred to the Council for their consideration.

Mr. L. C. TIPPER (Birmingham): My Lord Duke, it was my privilege to attend the World Wheat Conference at Regina, Canada, as one of the representatives of the Central Chamber of Agriculture, and we then had brought before us the facts about the enormous supplies of wheat produced all over the world. I do not propose to enter into that subject now, but last week I opened the pages of the Monthly Journal of the Ministry of Agriculture—probably some of you have already seen it—and saw there an undertaking, consisting of a number of clauses, by eighteen countries, some of them exporting countries, some of them importing countries, the importing countries including ourselves. On behalf of our Government a solemn undertaking has been entered into that the Government of this country will not take any steps in the future to advance further the development of wheat. It seems to me that, whilst we have been discussing disarmament in the way of guns and that sort of thing, to contract that we shall not increase practically our supplies of wheat is about the worst possible form of disarmament. During the last war we were on the verge of starvation—much nearer starvation than a good many people imagined—and I do not suppose if we do have another war (with all respect to our " peace at any price " people) we shall get our food over as well as we did in the last war. I am one of those who for very many years have been urging an increased development, on fair terms, on fair lines, of wheat in this country. I think this undertaking is a manifestly wrong thing. I do not think I am allowed to propose a resolution now, but I do hope that the Council of this Society will take the matter into consideration and approach the Government, if necessary. I have already had resolutions passed on this subject at my own local Chamber of Agriculture in Birmingham and at the meeting of the Central and Associated Chambers of Agriculture yesterday in London.

There is one other matter which, with your permission, Sir, I should like to mention, and that is that the British National Union are organizing a party of farmers—it is not confined to farmers, if others wish to join—to visit South Africa from January to May, and, if any members of the Royal Agricultural Society of England or their friends would like to join the party, the Secretary of the British National Union who has succeeded our old friend Mr. Canham will be very glad to hear from them.

Major R. A. DYOTT (Lichfield): I have been a member of this Society for some years, but this is the first occasion on which I have appeared in this room, and I have come to-day for a special purpose, that is, to plead the cause of the agricultural labourer.

I have read the reports and the publications of this Society for a number of years, and it seems to me that in the past we have confined ourselves perhaps too largely to the development of the scientific side of agriculture, the mechanical and the stock, and the man who works the machine, the man who develops the land, to my mind has been rather neglected. It seems to me, as a landowner and as a farmer, that there is no opening for our good men. I bring up a crowd of healthy young fellows and I get them on to a certain point, and then all promotion is blocked because the older men cannot get up higher.

What I want to put before the members of this Society and ask them seriously to consider is the question whether this Society would not deserve well of its country if it could inaugurate a sound system of peasant proprietorship. This matter cannot be dealt with by any member of the community alone. The moment you touch this question you are up against the local councils, landowners, and others.

What I want to press for is this. We have in our midst many men who, great economists and our leaders in the State tell us, will never have another day's work. To my mind that is most unsatisfactory, that many thousands of our fellow-men should never have the possibility of earning money again. Now I believe the problem is capable of solution if we make war upon the land, that is, if we tackle our agriculture with the same courage that we tackled the Germans with in the year 1914. We see in the Press and elsewhere that there is not sufficient work for the men in the towns in these days to do 48 hours' work a week, and it is contemplated that it will be brought down to 40 hours, then 30 hours, and so on. I believe, and I firmly believe, that it is possible for the great leaders of agriculture and the great leaders of industry to get together and inaugurate a system of small-holdings, whereby the agricultural labourer who has worked on the land and has deserved well of his master could buy a small-holding and make himself a peasant proprietor for the sum of not more than £200. I believe it would be possible for the great leaders of industry to guarantee those men, who deserve well of their country, so many hours' work per year at a fair wage. I believe that, with what they would make from their land and the guaranteed money they would get from some big factory, for instance, they could live healthy good lives, they could produce food not for an already overflooded market, and they could bring up their children to be good Englishmen.

I have men whom I am very fond of, who have served my family for generation after generation, and what have I to offer them ? Nothing ! Thirty shillings a week to these men who deserve very well of their country ! I do implore those of you who are in authority to consider this question. We offer men medals for working for us. A medal for a man who has worked for fifty years for me and for my father and my grandfather before me ! Would it not be better to say to these men : " You are good tillers of the soil. You have deserved well of your country. If you have saved up a bit I will put you here and guarantee you a little money and you can become landowners in your turn." They go up, the next men go up, the boys go up, the men in my cottages go up, and we are all lifted up. Work is found, no market is overflooded, and we have a prosperous country.

I implore you to consider this question of peasant proprietorship and not to confine yourselves only to stock breeding, science, and other matters. (Applause.)

Mr. F. ROPER COOKE (Kilburn): I have been a member of this Society for forty-two years, I believe, but I have never spoken at any of these meetings before. There is something very serious on my mind, and I am sure it is on the minds of all of you. In the paper this morning I saw that Mr. Foster of the Milk Marketing Board says that out of every three gallons of milk sold in this country two gallons come from abroad, and that next spring we shall be flooded with milk. Cannot the Royal Agricultural Society and some of the members of the Government who are here do something to get a duty put on the foreign milk, so that milk farmers in this country can produce their milk at a profit ? (Applause.) That is, I am sure, a very, very serious point, and I do beg and implore that the Government will do something for the milk problem.

The SECRETARY (Mr. T. B. Turner): All the suggestions made shall receive the attentive consideration of the Council.

Lord MILDMAY OF FLETE: With reference to the speech about peasant proprietorship, I have great sympathy, as all of us have, with much which was said by the speaker, but it is obvious that the first step to take in that direction is to make it in some degree certain that a peasant proprietor can get a living. (" Hear, hear.") At present it is far too uncertain.

I may say that the Royal Agricultural Society is ever striving, not only in the interests of the big farmers, not only in the interests of the smaller farmers, but in the interests of the agricultural labourers, to restore prosperity to the industry, and so contrive that the smallest men shall be able in the future to get a living from the land. (" Hear, hear," and applause.)

Mr. C. W. H. GLOSSOP, M.P.: Might I say how much I welcome the remarks of the speaker who dealt with the question of the importation of milk from abroad ?

I think his speech will very considerably strengthen the proposition, which I put forward to the Council this morning and which the Council accepted, in accordance with which they decided to write to the Minister and ask him to make an early statement with regard to the Government's decision on the continued importation of milk. If I might, I should like to thank the gentleman who has been kind enough to come here this afternoon and raise the same point that I raised this morning, because I think it does show that the dairy farmers throughout the country at the present time, anxious as we are to support the Milk Marketing Scheme, are naturally worried as to the future of that scheme, if the present importation of milk from foreign countries is allowed to continue. I do thank the gentleman who raised the point, because I think that his remarks will encourage the Council and perhaps will encourage the Government to take rigorous steps definitely to define their policy at a very early date, instead of, as has so often happened in the past, the Government of the day waiting till the eve of the crisis before announcing any particular decision.

Thanks to Retiring President.

Lord DESBOROUGH, who was received with applause, said: My Lord Duke, my Lords and Gentlemen, I have the very easy and very pleasant task to perform of proposing a most hearty vote of thanks to our retiring President for all the work he has done during his laborious year of office.

There is one thing we always want in the President of the Royal Agricultural Society, and it is a thing which I think we have always been successful in obtaining. We want a person to stand at our head who is well-known in his locality, and we had such a person in our late President. He bears a name which is not only honoured in the county of Derby but has been well known in English history, and he himself has added lustre to that name. (Applause.) We are also grateful to him for the personal work he has done. He was Chairman of the Local Committee, and he was most ably and munificently supported by Derby. That Local Committee, even in the present untoward circumstances, was a great success financially and could bear comparison favourably with the Committees which preceded it. The Show this year was the fifth that has been held at Derby.

There is one thing which always contributes a great deal to the success of the Royal Agricultural Show, and that is the presence of our King and Queen. ("Hear, hear.") Our Chairman was successful in securing their attendance. Of course, it is quite impossible for Their Majesties annually to attend the Show, but there is no doubt that, when they do come, it adds very greatly to the prospects of the success of the Show. ("Hear, hear.") Their Majesties were entertained in our Chairman's palatial home. The Show was also visited by the members of the World Economic Conference. Although they failed to be unanimous in any recommendations to remove the financial stringency under which the world is at present labouring, they were unanimous in their praises of the Show and also of the hospitality with which they were received at Derby. The Show was also very largely attended by distinguished people in many walks of life. We had Cabinet Ministers from our Dominions and farmers from abroad, several of whom we hope will be interested as buyers of the excellent stock which were exhibited at the Show. Our noble Chairman had the advantage of the immediate presence of the Honorary Director of the Show. (Applause.)

I join now in the very general wish that I should sit down! (Laughter.) Before doing so I should like to propose this resolution :—

> "That a hearty vote of thanks be accorded to the Duke of Devonshire for his services as President during the year."

(Applause.)

Sir ARTHUR HAZLERIGG: Your Grace, my Lords and Gentlemen, when at the Annual Meeting last year, in the absence of Lord Desborough, I had the honour of proposing that the Duke of Devonshire should be our President for the year when the Show was at Derby, I said that if you elected him you would do the best possible thing you could for the Royal Agricultural Society of England and for the Show at Derby. It is a matter of very great satisfaction, though of no surprise, that that prophecy proved correct. (" Hear, hear.") We could not have had a better President at any of our meetings and our deliberations in London, and we could not have had a President one quarter as good for the Show at Derby. (" Hear, hear.") The Chairman was on the Showground for many days of the Show. He was always interested in what was going on. He took every occurrence as it came with the greatest affability, even when he was smothered with a bag of flour ! (Laughter.) It takes some doing to be affable when a thing like that happens !

I can now say that I have the very greatest pleasure in seconding the vote of thanks to the Duke of Devonshire which Lord Desborough proposed. (Applause.)

The resolution was put to the meeting by Lord DESBOROUGH and carried with acclamation.

The PRESIDENT : My Lords and Gentlemen, I thank you very sincerely indeed for the extremely kind vote of thanks you have passed to me, although I can assure you that no thanks were needed from you. In fact, it is very much more the other way : I ought to return my thanks to you for having given me the opportunity of again having the privilege of serving as President of this great Society. My year of office has been a very happy and a very pleasant year to me, and I can very truthfully say that I am extremely sorry it is over and that I wish, instead of having the Derby Show to look back upon, we were going to look forward to it. (" Hear, hear.") In fact, I most cordially agree with somebody I met the other day in Derby, who said : " When is it likely that the Royal Show will come to Derby again ? " I said it probably would not be in my lifetime ; I am getting on now a bit. I only hope, however, that on the next occasion when the Royal Show does come to Derby, however many years off that may be, it will have as warm a welcome as it had this year and that it will be equally successful as a Show. We have many reasons to be grateful for what took place during last summer. For one thing, we had an exceptionally fine summer, although I dare say it was rather trying at times both to visitors and certainly, I am afraid, to some of the stock which were exhibited. We were extremely fortunate in having so fine a spell of weather. Except for a slight shower on the last day of the Show, there was not a drop of rain throughout. Of course, we are exceptionally favoured in being honoured by the visit of Their Majesties the King and Queen. They took the greatest possible interest in everything connected with the Society. I can honestly say that I felt very proud of my county and of my home town. They did their very best, I think. We were able to put up an interesting exhibition, I think, both of the local industries and one or two new features in connection with the Show, principally with reference to the coal industry. I am very glad indeed to have this opportunity of expressing my very great gratitude to them for the more than generous support that they gave me during my year of office.

As far as the Council is concerned, I am glad to say that I shall be able to vacate the Presidential Chair taken by Lord Stradbroke with the knowledge that he will find a very happy family in the Council and that the Society, through its Committees, is admirably organized to-day. It deals rapidly and effectively with all the business that comes before it, and no one could find more pleasant people to work with than the Secretary, Mr. Turner, and the Honorary Director, Mr. Burke. I do not anticipate that Lord Stradbroke will ever have any very difficult problems to face, but I can assure him that, however difficult a problem may be, if he will freely take Mr. Turner and Mr. Burke into his confidence he will very rapidly find a solution of it. (" Hear, hear.")

I can only thank you again, Gentlemen, most sincerely not only for the vote of thanks which you have been good enough to pass to me to-day but also for the very generous and kind support which you have given me during my year of office, which I shall always look back upon with the greatest possible satisfaction. I hope that the visit of " the Royal " to Derby will be another landmark in the history of the Society. (" Hear, hear.")

This is not a time to weary you with historical matters and certainly not with matters of controversy, but it may be of some interest to some of you to know that 135 years ago to-day an important decision was taken in Derby. The Young Pretender, or, as some people might prefer to call him, Prince Charles Edward, decided to abandon his march on London and retire to Scotland. That was an important decision which was taken in Derby. I venture to think that since then we have been able to do something even more valuable than that in Derby, and, amongst the many happy episodes which have occurred in the history of that town, none will stand out with more certainty than the visits of " the Royal ". I hope that if on some future occasion—it may be long after I have gone—the Society again visits Derby it will be as fortunate as we have been during the present year. Again I thank you. (Applause.)

Royal Agricultural Society of England.

AWARDS OF PRIZES
AT
DERBY, 1933.

ABBREVIATIONS.

I., First Prize. II., Second Prize. III., Third Prize. IV., Fourth Prize. V., Fifth Prize. R.N., Reserve Number. H.C., Highly Commended. C., Commended.

The responsibility for the accuracy of the description or pedigree and for the eligibility to compete of the animals entered in the following classes, rests solely with the Exhibitors.

Unless otherwise stated, each Prize Animal in the Classes for Horses, Cattle, Goats, Sheep, and Pigs, was "bred by Exhibitor".

HORSES.

Shires.

Class 1.—*Shire Stallions born in* 1930.

1 **I. £20 & Champion.**[1]—H. & R. Ainscough, Ltd., Burscough Mills, Burscough, Lancs., for **Burscough Forest King** 41108, bay; *s.* Ansty Forest Ruler 39829, *d.* 107314 Burscough Victoria *by* Claymore 33114.

5 **II. £10 & R.N. for Champion.**[1]—Sir Bernard Greenwell, Bart., Marden Park, Woldingham, Surrey, for **Marden Waggoner** 40980, bay; *s.* Stretton Broadside 39985, *d.* 117805 Belvidere Judy *by* Sundridge Nulli Secundus 36952.

4 **III. £5**—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring, for **Edingale Clansman** 40909, brown, bred by W. R. Lyke, Lawton Bury, Leominster; *s.* Ledwyche Clansman 39242, *d.* 84475 Crosswood Belle *by* Gaer Conqueror 25218.

6 **R.N.**—Norman R. Lloyd, Walcot, Chirbury, Montgomery, for **Severn Statfold.**

Class 2.—*Shire Stallions, born in* 1931.

12 **I. £20.**—G. R. C. Foster, Anstey Hall, Trumpington, Cambridge, for **Bower Nulli Secundus** 41100, bay; *s.* Statfold Nulli Secundus 40170, *d.* 119685 Eveline *by* Lincoln What's Wanted 2nd 35812.

10 **II. £10.**—William J. Cumber, Theale, Berks., for **Theale Josh** 41311, grey, bred by A. Ward, Appleby Magna, Ashby-de-la-Zouch; *s.* Snelston Harvester 40620, *d.* 97086 Bonny Grey *by* Charming Prince 3rd 33818.

11 **III. £5.**—James Forshaw & Sons, Carlton-on-Trent, Newark, for **Radiation** 41268, bay, bred by W. Galloway, Bush End, Bishop's Stortford; *s.* Radium 5th 40376, *d.* 119467 Carlton Lady Welbeck *by* Welbeck Redlynch 36204.

8 **R.N.**—J. Morris Belcher, Tibberton Manor, Wellington, Shropshire, for **Rowley Hill Prince Albert.**

H.C.—7, 9.

Class 3.—*Shire Stallions, born in* 1932.

17 **I. £20.**—William J. Cumber, Theale, Berks., for **Haseley Harvester**, brown, bred by Milton Harris, Little Milton Manor, Oxford; *s.* Pendley Harvester 40368, *d.* 122080 Haseley Clansman's Lady *by* Cowage Clansman 38767.

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[1] Champion Gold Medal, and £5 to the Reserve, given by the Shire Horse Society for the best Stallion. A Prize of £2 is also given by the Shire Horse Society to the Breeder of the Champion Stallion, provided the Breeder is a Member of the Shire Horse Society, and the dam of the animal is registered in the Shire Horse Stud Book.

19 **II. £10.**—The Duke of Devonshire, K.G., Chatsworth, Bakewell, for **Chatsworth Blend**, brown, bred by Col. Nicholson, Leek, Staffs.; *s.* Edingale Blend 40272, *d.* 119855 Leek Coral *by* Pendley Footprint 37728.

15 **III. £5.**—His Majesty The King, Sandringham, Norfolk, for **Appleton Binder**, brown; *s.* Pendley Harvester 40368, *d.* 121191 Pendley Choice *by* Monk's Green Friar 35891.

18 **R.N.**—William J. Cumber, for **Theale All Wrong.**

Class 4.—*Shire Mares, with their own foals at foot.*

23 **I. £20.**—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring, for **124276 Westonavon Monks Charity**, bay, born in 1926 [foal *by* Raans Record 40796], bred by R. Bluck, Weston Farm, Stratford-on-Avon; *s.* Ingon Champion 39222, *d.* 110579 Westonavon Nun *by* Eaton Monk 22321.

24 **II. £10.**—A. H. Clark & Son, Moulton Eaugate, Spalding, for **121579 Alsager Peach**, bay, born in 1927 [foal *by* Bower Winalot 40672], bred by T. S. Piddock, Alsager, Cheshire; *s.* Moulton Harboro 39559, *d.* 101014 Alsager Future Queen *by* Champion's Goalkeeper 30296.

25 **III. £5.**—The Duke of Devonshire, K.G., Chatsworth, Bakewell, for **123425 Theale Abbess**, bay, born in 1928 [foal *by* Chearsley Surprise 40493], bred by H. W. T. Smith, Fenny Compton, Leamington; *s.* Old Leys Record 38938, *d.* Farnborough Friar Queen *by* Rievaulx Friar 36013.

32 **R.N.**—John A. Kay, Ravenscroft Hall, Middlewich, for **Tabley Pearl.**
H.C.—27.

Class 5.—*Shire Colt or Filly Foals, the produce of Mares entered in Class* 4.[1]

36 **I. £10.**—The Duke of Devonshire, K.G., Chatsworth, Bakewell, for **Chatsworth Lady Surprise**, bay filly, born April 4; *s.* Chearsley Surprise 40493, *d.* 123425 Theale Abbess *by* Old Leys Record 38938.

38 **II. £5.**—G. R. C. Foster, Anstey Hall, Trumpington, Cambridge, for bay filly, born April 21; *s.* Bower Winalot 40672, *d.* 120596 Bower Queenmaker *by* Histon Goalkeeper 39218.

42 **III. £3.**—John A. Kay, Ravenscroft Hall, Middlewich, for **Ravenscroft Pearl 2nd**, black filly, born May 3; *s.* Snelston Blusterer 40401, *d.* 120308 Tabley Pearl *by* Hadlow Prince William 36605.

34 **R.N.**—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
H.C.—37.

Class 6.—*Shire Mares, born in or before* 1929, *not having foals at foot. A Mare* 6 *years old or over must have produced a live foal in* 1932 *or* 1933.[1]

44 **I. £15 & Champion.**[2]—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring, for **122744 Albany Queen**, bay, born in 1928, bred by William Webster & Son, Newstead Farm, Stockton on Forest; *s.* Darley Wild Wave 38149, *d.* 113420 Albany March Countess *by* March King 34955.

46 **II. £10 & R.N. for Champion.**[2]—A. H. Clark & Son, Moulton Eaugate, Spalding, for **123228 Moors Charm**, bay, born in 1928, bred by John Vaughan, Rhalt, Welshpool; *s.* Moulton Harboro' 39559, *d.* 103818 Gleadless Forest Queen *by* Friar Tuck 4th 31447.

47 **III. £5.**—G. R. C. Foster, Anstey Hall, Trumpington, Cambridge, for **123619 Bower Leading Lady**, bay, born in 1929; *s.* Bower Black Prince 39848, *d.* 89020 Claypole Dray Queen *by* Goadby Drayman 27367.

Class 7.—*Shire Fillies, born in* 1930.

50 **I. £20.**—John A. Kay, Ravenscroft Hall, Middlewich, for **124878 Ravenscroft Rarity**, bay; *s.* Wrydelands Dreadnought 35325, *d.* 113606 Black Bess *by* Hadlow Prince William 36605.

48 **II. £10.**—Joseph Foster, Heath Top, Church Broughton, Derbyshire, for **125870 Heath Top Queen**, bay; *s.* Sundridge Nulli Secundus 36952, *d.* 120889 Heath Top Rosebud *by* Colney Clansman 33840.

52 **III. £5.**—W. Stuart, Sowerby Hall, St. Michael's, Preston, for **124948 Sowerby Queenie**, bay; *s.* Kirkland Statesman 40097, *d.* 117373 Sowerby Vanity *by* Moulton Swell 3rd 35010.

Class 8.—*Shire Fillies, born in* 1931.

57 **I. £20.**—G. R. C. Foster, Anstey Hall, Trumpington, Cambridge, for **125597 Pendley Lady May**, brown, bred by Sir Gomer Berry, Bart., Pendley Stock Farms, Tring; *s.* Pendley Harvester 40368, *d.* 118409 Kerry Clanish Maid *by* Basildon Clansman 36277.

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[1] Prizes given by the Shire Horse Society

[2] Champion Gold Medal, and £5 to the Reserve, given by the Shire Horse Society for the best Mare or Filly. A Prize of £2 is also given by the Shire Horse Society to the Breeder of the Champion Mare or Filly, provided the Breeder is a Member of the Shire Horse Society, and the dam of the animal is registered in the Shire Horse Stud Book.

55 II. £10.—WILLIAM CLARK & SON, Raans Farm, Amersham, Bucks., for 125635 **Raans Wild Rose**, brown; *s.* Pendley Harvester 40368, *d.* 114353 Gunby Autumn Briar Rose *by* Normanby Briar King 32672.

54 III. £5.—A. H. CLARK & SON, Moulton Eaugate, Spalding, for 125542 **Moulton Opal**, bay; *s.* Moulton Craftsman 40358, *d.* 118648 Moulton Goldflake *by* Pendley Goldmine 38949.

58 R.N.—SIR GOMER BERRY, BART., Pendley Stock Farms, Tring, for **Castle Boughrood Clanish Lady**.

H.C.—59.

Class 9.—*Shire Fillies, born in* 1932.

66 I. £20.—ALLAN HOLM & SON, The Grange, Tilton, Leicestershire, for **Tilton Lady in White**, dark brown; *s.* Radium 5th 40376, *d.* 119057 Tilton Abbess *by* Monks Green Friar 35891.

64 II. £10.—SIR BERNARD GREENWELL, BART., Marden Park, Woldingham, Surrey, for **Marden Bracelet**, bay; *s.* Stretton Broadside 39985, *d.* 123997 Marden Verbena *by* Cowage Dalesman 39149.

Class 10.—*Shire Geldings by registered sires, born in or before* 1930.[1]

69 I. £20.—CHARLES FRANKLIN, 10, Bank Buildings, Bedford, for **Pendley Warrant**, bay, born in 1928, bred by Bibby Bros., Coat Green Farm, Carnforth; *s.* Lincoln's What's Wanted 2nd 35812, *d.* 111306 Coat Green Encore *by* Rokeby Clansman 36028.

70 II. £15.—MANN, CROSSMAN & PAULIN, LTD., Albion Brewery, Whitechapel Road, London, E.1, for **Gilbert**, bay, born in 1927, bred by James Allison, Nash Hall, Ongar; *s.* Ratcliffe Menestrel 36847.

71 III. £10.—MANN, CROSSMAN & PAULIN, LTD., for **Victor**, bay, born in 1929, bred by Mr. Cope, Beamest, Uttoxeter; *s.* Premier Clan Leader 40149, *d.* by Kings Warrior 31563.

68 IV. £5.—BURTON CORPORATION, Blakeley Lodge, Etwall, Derby, for **Boxer**, grey, born in 1928, bred by T. Woolliscroft, Sharplow, Tissington, Ashbourne; *s.* Sundridge Nulli Secundus 36952.

Clydesdales.

Class 11.—*Clydesdale Stallions, born in* 1931.

77 I. £20 & Champion.[2]—T. & M. TEMPLETON, Sandyknowe, Kelso, for **Beneficial** 22074, brown, bred by Robert Wilson, Kirkholm, Ballantrae; *s.* Benefactor 20867, *d.* Kirkholm Margaret 58777 *by* Dunure Measure 20744.

74 II. £10.—JAMES KILPATRICK, Hawkrigg House, Wigton, Cumberland, for **Hawkrigg Eldorado** 22138, bay, bred by Archie Boadle, Westend, Flimby, Maryport; *s.* Ardyne Refiner 19606, *d.* Clementine 58830 *by* Craigie McQuaid 20724.

72 III. £5.—DAVID ADAMS, Auchencraig, Dumbarton, for **Dunlop's Renown** 22124, bay, bred by Andrew Cochran, High Ardwell, Stranraer; *s.* Renown 21525, *d.* Bonnie Jean 55185 *by* Dunure Luxury 19108.

Class 12.—*Clydesdale Stallions, born in* 1932.

85 I. £20 & R.N. for Champion.[2]—T. & M. TEMPLETON, Sandyknowe, Kelso, for **Watchword**, dark roan, bred by Exhibitors; *s.* Benefactor 20867, *d.* Eva 57351 *by* Tristan 20478.

81 II. £10.—HENRY MURDOCH, Balgreen, Hollybush, for **Balgreen Castle**, brown; *s.* Douglas Castle 21620, *d.* Balgreen Remembrance 59071 *by* Farleton Footprint 20752.

79 III. £5.—ALLAN CLARK, Woodbank, Windygates, Fife, for **Strathore James**, brown, bred by James Gray, West Newhall, Kingsbarns; *s.* Woodbank Majestic 21398, *d.* Crawfordston Margaret 58510 *by* Botha 19026.

82 R.N.—EDWARD NICHOL, Clifton, Morpeth, for **Clifton Black Rod**.

Class 13.—*Clydesdale Mares, born in or before* 1930.

86 I. £20 & Champion.[3]—G. M. BECK, The Lane, Ravenstonedale, Westmorland, for **Lane Lucky Girl**, brown, born in 1929; *s.* Benefactor 20867, *d.* Craigie Beauty 56012 *by* Dunure Footprint 15203.

89 II. £10 & R.N. for Champion.[3]—HENRY MURDOCH, Balgreen, Hollybush, for **Balgreen Charm**, black roan, born in 1930; *s.* Douglas Castle 21620, *d.* Balgreen Mayflower 58200 *by* Craigie Prince Charming 20584.

Class 14.—*Clydesdale Fillies, born in* 1931.

93 I. £20.—ROBERT DALZIEL, Rue, Auldgirth, Dumfriesshire, for **Rue Marcelline**, brown; *s.* Scotland's Marcellus 21388, *d.* Rue May Queen 57974 *by* Balcairn Footnote 20701.

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[1] Prizes given by the Shire Horse Society.

[2] Champion Silver Medal given by the Clydesdale Horse Society for the best Stallion.

[3] Champion Silver Medal given by the Clydesdale Horse Society for the best Mare or Filly.

97 **II. £10.**—Robert Taylor, Milton Hall, Brampton Junction, Cumberland, for **Lady Bute**, dark brown, bred by William McFarlane, Meikle Kilchattan, Rothesay; *s.* Benefactor 20867, *d.* Meikle Darling 57671 *by* Dunure Umpire 19711.

94 **III. £5.**—James Little, High House Farm, Bebside, Northumberland, for **Annie Mary of Slealands**, black, bred by Joseph Batey & Sons, Slealands, Longtown, Cumberland; *s.* Kirtle Refiner 21649, *d.* Slealands Peggy 58389 *by* Pickston 20801.

95 **R.N.**—Edward Nichol, Clifton, Morpeth, for **Clifton Luxury.**

Class 15.—*Clydesdale Geldings by registered sires, born in or before* 1930.[1]

100 **I. £20.**—Messrs. Greig, Housenrigg, Brayton, Aspatria, for **The Yett**, bay, born in 1929, bred by John Drennan, Croft Head, Mauchline; *s.* Aitkenbrae Free Print 21023.

98 **II. £10.**—Messrs. Greig, for **Fashion**, black, born in 1930, bred by Messrs. Jackson, Stainburn, Workington; *s.* Cumberland Fashion 19982.

Suffolks.

Class 16.—*Suffolk Stallions, born in or before* 1929.[2]

108 **I. £20 & Champion.**[3]—Dennis Walker, Trowse, Norwich, for **Lord Foch of Frithville** 6174, born in 1929, bred by F. S. Fairweather, Whatfield, Ipswich; *s.* Sudbourne Foch 4869, *d.* Hadleigh Ceres 13598 *by* Ashmoor Cornsheaf 5286.

106 **II. £10 & R.N. for Champion.**[3]—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Red Gold of Wratting** 5932, born in 1927, bred by Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge; *s.* Worlingham Red Gold 5506, *d.* Bawdsey Sappho 11350 *by* Earl Gray 4219.

103 **III. £5.**—P. A. Bayman, Easton Hall, Easton, Woodbridge, for **Wanstead Wedgewood** 6136, born in 1927; *s.* Coney Weston Scarab 5524, *d.* Rose of Gold 10140 *by* Morston Wallace 3987.

107 **R.N.**—Dennis Walker, for **Agile of Giffords.**

Class 17.—*Suffolk Stallions, born in* 1930.

115 **I. £20.**—Arthur T. Pratt, Morston Hall, Trimley, Ipswich, for **Worlingworth Bonfire** 6244, bred by E. H. Preston, Worlingworth, Suffolk; *s.* Bawdsey Bountiful 5551, *d.* Freda 8137 *by* Morston Marshal 3998.

117 **II. £10.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Woolverstone Beaufort** 6126, bred by Major J. A. Berners, Woolverstone Park, Ipswich; *s.* Fornham Beatty 4942, *d.* Ruby 10377 *by* Morston Gold Guard 4234.

113 **III. £5.**—Stuart Paul, Kirton Lodge, Ipswich, for **Samford Monarch** 6213; *s.* Shotley Counterpart 4903, *d.* Buckanay Charity 12972 *by* Morston Connaught 4590.

111 **R.N.**—W. G. Harvey, Stewart Elm Farm, Stambridge, Rochford, for **Rushmere Hallmark.**

C.—118, 119.

Class 18.—*Suffolk Stallions, born in* 1931.

125 **I. £20.**—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for **Bawdsey Dear Sir** 6228; *s.* Sir Harry of Morston 5676, *d.* Bawdsey Dear 11352 *by* Bawdsey Hay 4188.

122 **II. £10.**—R. H. & R. Paul, Broxtead, Sutton, Woodbridge, for **Broxtead Vanguard** 6303; *s.* Horstead Vanguard 4784, *d.* Nortoncan Prude 12929 *by* Fakenham Peter 5063.

124 **III. £5.**—Arthur T. Pratt, Morston Hall, Trimley, Ipswich, for **Morston Peer** 6222; *s.* Darsham Duke 5878, *d.* Orwell Bee 12765 *by* Orwell Gold Sun 5163.

121 **R.N.**—H. W. Daking, Rose Farm, Thorpe-le-Soken, for **Dunwich Admiral.**

C.—130.

Class 19.—*Suffolk Stallions, born in* 1932.

131 **I. £20.**—W. G. Harvey, Stewart Elm Farm, Stambridge, Rochford, for **Kentish Hotspur** 6329; *s.* Martley King of Diamonds 5772, *d.* Kentish Hope 12455 *by* Sudbourne Beau Brocade 4235.

Class 20.—*Suffolk Mares, with their own foals at foot.*

136 **I. £20 & Champion.**[4]—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for **Bawdsey Seedling** 14806, born in 1927 [foal *by* Bawdsey Seer 6148]; *s.* Worlingham Red Gold 5506, *d.* Bawdsey Hayseed 9496 *by* Bawdsey Hay 4188.

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[1] Prizes given by the Clydesdale Horse Society.

[2] Prizes given by the Suffolk Horse Society.

[3] The "Coronation" Perpetual Silver Challenge Cup given by the Suffolk Horse Society for the best Stallion.

[4] Champion Prize of £10 given by the Suffolk Horse Society for the best Mare or Filly.

140 **II. £10.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Raveningham Doreen** 12357, born in 1923 [foal *by* Woolverstone Beaufort 6126], bred by E. S. Buck & Son, Raveningham, Norwich; *s.* Sudbourne Foch 4869, *d.* Hasketon Flo 7076 *by* Sproughton Gold Ring 3347.

138 **III. £5.**—Frank Sainsbury, for **Bawdsey Lustre** 13687, born in 1925 [foal *by* Red Gold of Wratting 5932], bred by Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge; *s.* Framlingham Allenby 4826, *d.* Bawdsey Sunbeam 7044 *by* Bawdsey Harvester 3076.

144 **IV. £4.**—Owen H. Smith, Langham, Oakham, for **Vivandière** 14879, born in 1927 [foal *by* Morston Countermand 5820], bred by Cordy Wolton, Lavenham, Suffolk; *s.* Sudbourne Foch 4869, *d.* Lavenham Belle 11304 *by* Sudbourne Bellicose 4617.

133 **R.N.**—P. A. Bayman, Easton Hall, Easton, Woodbridge, for **Wanstead Matchless 3rd.**

H.C.—141. **C.**—134.

Class 21.—*Suffolk Colt Foals, the produce of Mares in Class* 20.[1]

146 **I. £10.**—E. S. Buck & Son, Sycamore Farm, Raveningham, Norwich, for foal born Feb. 14; *s.* Sudbourne Premier 4963, *d.* Hexton Constance 15724 *by* Shotley Counterpart 4903.

148 **II. £5.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for foal born March 5; *s.* Red Gold of Wratting 5932, *d.* Bawdsey Lustre 13687 *by* Framlingham Allenby 4826.

149 **III. £3.**—Frank Sainsbury, for foal born March 24; *s.* Red Gold of Wratting 5932, *d.* Wratting Empress 15236 *by* Bawdsey Emperor 5717.

150 **R.N.**—Owen H. Smith, Langham Oakham.

Class 22.—*Suffolk Filly Foals, the produce of Mares in Class* 20.[1]

153 **I. £10.**—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for foal born April 9; *s.* Bawdsey Seer 6148, *d.* Bawdsey Seedling 14806 *by* Worlingham Red Gold 5506.

152 **II. £5.**—P. A. Bayman, Easton Hall, Easton, Woodbridge, for foal born March 3; *s.* Wanstead Wedgewood 6136, *d.* Wanstead Matchless 3rd 14149 *by* Fornham Beatty 4942.

155 **III. £3.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for foal born March 25; *s.* Woolverstone Beaufort 6126, *d.* Raveningham Silver Star 14499 *by* Raveningham Cider Cup 5326.

154 **R.N.**—Frank Sainsbury.

Class 23.—*Suffolk Mares, born in or before* 1929, *not having foals at foot. A Mare* 6 *years old or over must have produced a live foal in* 1932 *or* 1933.[1]

168 **I. £15.**—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for **Bawdsey Painted Doll** 15675, born in 1929; *s.* Bawdsey Ian 5838, *d.* Bawdsey China Doll 2nd 7252 *by* Bentley War Cry 3028.

159 **II. £10.**—E. S. Buck & Son, Sycamore Farm, Raveningham, Norwich, for **Willingham Belle** 14287, born in 1926, bred by W. R. Frost, Willingham Hall, Suffolk; *s.* Admiral John 5127, *d.* Belle 10229 *by* Henham Aerolite 4343.

164 **III. £5.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Ursula** 15235, born in 1928, bred by W. H. Allen, Harkstead Hall, Ipswich; *s.* Fornham Beatty 4942, *d.* Marigolds Bloom 11469 *by* Woolverstone Checkmate 4683.

158 **R.N.**—Lt.-Col. F. G. G. Bailey, Lake House, Salisbury, for **Kesgrave Moggy.**

Class 24.—*Suffolk Fillies, born in* 1930.

170 **I. £20 & R.N. for Champion.**[2]—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for **Bawdsey Secret** 16100; *s.* Sir Harry of Morton 5676, *d.* Bawdsey Surety 14225 *by* Sudbourne Premier 4963.

167 **II. £10.**—J. W. Bullard, Willingham Hall, Beccles, Suffolk, for **Drin** 16182; *s.* Blackmore Hopeful 5206, *d.* Beauty *by* Admiral John 5127.

166 **III. £5.**—P. A. Bayman, Easton Hall, Easton, Woodbridge, for **Wanstead Marigold 3rd** 16047; *s.* Sudbourne Premier 4963, *d.* Wanstead Marigold 13130 *by* Fornham Beatty 4942.

169 **R.N.**—Sir Cuthbert Quilter, Bart., for **Bawdsey Louise.**

Class 25.—*Suffolk Fillies, born in* 1931.

174 **I. £20.**—W. G. Harvey, Stewart Elm Farm, Stambridge, Rochford, for **Croft Donella** 16453, bred by F. Newton Pratt, Croft Farm, Kirton, Ipswich; *s.* Buckanay Nelson 5709, *d.* Easton Prima Donna 8631 *by* Sudbourne Peter 3955.

173 **II. £10.**—W. G. Harvey, for **Kentish Ruby** 16513; *s.* Martley King of Diamonds 5772, *d.* La Belle Rouge 10611 *by* Sudbourne Beauchief 4215.

176 **III. £5.**—Stuart Paul, Kirton Lodge, Ipswich, for **Samford Nectar** 16410; *s.* Buckanay Nelson 5709, *d.* Lavenham Judy 13787 *by* Wretham Dreadnought 5059.

175 **R.N.**—R. H. & R. Paul, Broxtead, Sutton, Woodbridge, for **Broxtead June.**

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[1] Prizes given by the Suffolk Horse Society.

[2] Champion Prize of £10 given by the Suffolk Horse Society for the best Mare or Filly.

Class 26.—*Suffolk Fillies, born in* 1932.

178 I. £20.—Lady Loder, Leonardslee, Horsham, for **Leonardslee Seaweed 16621** *s.* Blyford Seabroc 5467, *d.* Hawstead Blossom 12437 *by* Sudbourne Bandolier 5153.

180 II. £10.—Arthur T. Pratt, Morston Hall, Trimley, Ipswich, for **Morston Dame 16960**; *s.* Darsham Duke 5878, *d.* Orwell Bee 12765 *by* Orwell Gold Sun 5163.

181 III. £5.—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for **Bawdsey Secern 16896**; *s.* Bawdsey Martian 6029, *d.* Bawdsey Surety 14225 *by* Sudbourne Premier 4963.

179 R.N.—J. A. Marsden Popple, Daneshill, Stevenage, for **Gipping Wendy.**

Class 27.—*Suffolk Geldings, by registered sires, born in or before* 1930.[1]

183 I. £20.—W. G. Harvey, Stewart Elm Farm, Stambridge, Rochford, for **Prince**, born in 1929; *s.* Sudbourne Premier 4963, *d.* Ringshall Cavell 10080.

187 II. £10.—Stuart Paul, Kirton Lodge, Ipswich, for **Prince**, born in 1928, bred by the Exors. of the late Spencer Dawson, Stratton Hall, Ipswich; *s.* Shotley Counterpart 4903, *d.* Stratton Cherry 11804 *by* Earl Gray 4219.

182 III. £5.—Frank R. Garrard, The Hall, Framlingham, Woodbridge, for **Marmaduke**, born in 1928; *s.* Woolverstone Checkmate 4683, *d.* Kitty 10775 *by* Bawdsey Marshal Ney 3385.

189 R.N.—Capt. the Hon. J. St. V. Saumarez, Broke Hall, Nacton, Suffolk, for **John.**

C.—185, 186.

Percherons.

Class 28.—*Percheron Stallions, born in or before* 1930.[2]

190 I. £20 & Champion.[3]—Sir Henry H. A. Hoare, Bart., Stourhead, Zeals, Wilts., for **Stourhead Lagor B. 424**, grey, born in 1928; *s.* Lagor B. 1, *d.* Torsade B. 483 *by* Polygone F. 125447.

192 II. £10.—Duncan M. Stewart, Millhills, Crieff, Perthshire, for **Histon Drayman 9th B. 410**, light grey, born in 1927, bred by Chivers & Sons, Ltd., Histon, Cambridge; *s.* Lagor B. 1, *d.* Prolifere B. 191 *by* Jugal F. 85444.

194 III. £5.—H. H. Truman, The Maze, March, Cambs., for **March Viking B. 473**, grey, born in 1929; *s.* Hache Viking B. 144, *d.* Easter B. 415 *by* Iberes F. 82972.

Class 29.—*Percheron Stallions, born in* 1931.

198 I. £20, Champion[4] & R.N. for Champion.[3]—John Pierpont Morgan, Wall Hall Watford, for **Aldenham Warrior B. 516**, dark grey; *s.* Histon Drayman 4th B. 340, *d.* Greyling Welcome B. 443 *by* Rhum B. 53.

196 II. £10.—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Black Knight B. 508**, black; *s.* Carburateur B. 403, *d.* Angleterre B. 507 *by* Quompromis F. 132081.

197 III. £5.—Col. Arthur Dugdale, Sezincote, Moreton-in-Marsh, for **Claverdon Yeoman B. 566**, grey, bred by E. G. Wheler-Galton, Claverdon, Warwick; *s.* Histon Drayman 9th B. 410, *d.* Remplie B. 257 *by* Instar F. 78857.

195 R.N.—Chivers & Sons, Ltd., for **Histon Blacksmith.**

Class 30.—*Percheron Stallions, born in* 1932.

200 I. £20 & R.N. for Champion.[4]—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Cavalier B. 562**, dark grey; *s.* Cense B. 409, *d.* Petronne B. 176 *by* Japon F. 84819.

201 II. £10.—Chivers & Sons, Ltd., for **Histon Favourite Lad B. 563**, light grey; *s.* Cense B. 409, *d.* Buscot Favourite B. 894 *by* Evenlode Benjamin B. 261.

202 III. £5.—John Pierpont Morgan, Wall Hall, Watford, for **Aldenham Dodger B. 549**, grey; *s.* Histon Drayman 4th B. 340, *d.* Diablesse B. 852 *by* Quaduc F. 129371.

205 R.N.—H. H. Truman, The Maze, March, Cambs., for **March Hengist.**

Class 31.—*Percheron Mares, with their own foals at foot.*

208 I. £20 & Champion.[5]—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Beauty 4th B. 878**, grey, born in 1928 [foal *by* Carburateur B. 403]; *s.* Villabon B. 276, *d.* Palette B. 180 *by* Latin F. 100016.

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[1] Prizes given by the Suffolk Horse Society.

[2] Prizes given by the British Percheron Horse Society.

[3] Perpetual Silver Challenge Cup given by the British Percheron Horse Society for the best Stallion.

[4] Perpetual Silver Challenge Cup given by the British Percheron Horse Society for the best Stallion in Classes 29 and 30 born in Great Britain.

[5] Perpetual Silver Challenge Cup given by the British Percheron Horse Society for the best Mare or Filly.

209 **II. £10.**—John Pierpont Morgan, Wall Hall, Watford, for **Baudruche B. 685**, light grey, born in 1923 [foal *by* Histon Drayman 4th B. 340], bred by L. Guion, Landes, Bellou-sur-Huisne, Orne, France; *s.* Qroisy F. 130286, *d.* Nattière F. 114659 *by* Joyeaux F. 84874.

210 **III. £5.**—John Pierpont Morgan, for **Histon Lady 6th B. 831**, dark grey, born in 1927 [foal *by* Histon Matchless B. 466], bred by Chivers & Sons, Ltd., Histon, Cambridge; *s.* Mylord B. 275, *d.* Histon Lady 2nd B. 375 *by* Brilliant H. B. 42.

Class 32.—*Percheron Colt or Filly Foals, the produce of Mares in Class* 31.

213 **I. £10.**—Chivers & Sons, Ltd., Histon, Cambridge, for dark grey filly, born March 25; *s.* Carburateur B. 403, *d.* Histon Beauty 4th B. 878 *by* Villabon B. 276.

214 **II. £5.**—John Pierpont Morgan, Wall Hall, Watford, for grey filly, born Feb. 3; *s.* Histon Drayman 4th B. 340, *d.* Baudruche B. 685 *by* Qroisy F. 130286.

215 **III. £3.**—John Pierpont Morgan, for dark grey colt, born April 20; *s.* Histon Matchless B. 466, *d.* Histon Lady 6th B. 835 *by* Mylord B. 275.

Class 33.—*Percheron Fillies, born in* 1931.

218 **I. £20, Champion[1] & R.N. for Champion.[2]**—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Rosalind B. 1046**, light grey; *s.* Cense B. 409, *d.* Rovigno B. 256 *by* Mylord B. 275.

222 **II. £10.**—John Pierpont Morgan, Wall Hall, Watford, for **Aldenham Doris B. 1050**, grey; *s.* Histon Drayman 4th B. 340, *d.* Evenlode Deborah B. 698 *by* Evenlode Valiant B. 133.

219 **III. £5.**—Chivers & Sons, Ltd., for **Histon Satire B. 1047**, dark grey; *s.* Cense B. 409, *d.* Saga B. 584 *by* Nonce F. 117982.

Class 34.—*Percheron Fillies, born in* 1932.

228 **I. £20 & R.N. for Champion.[1]**—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Beauty 6th B. 1114**, light grey; *s.* Cense B. 409, *d.* Histon Beauty 2nd B. 779 *by* Villabon B. 276.

226 **II. £10.**—John Pierpont Morgan, Wall Hall, Watford, for **Aldenham Beauty B. 1093**, light grey; *s.* Histon Drayman 4th B. 340, *d.* Baudruche B. 685 *by* Qroisy F. 130286.

225 **III. £5.**—Col. Arthur Dugdale, Sezincote, Moreton-in-Marsh, for **Evenlode Kitty B. 1088**, grey, bred by Evenlode Stud, Sezincote, Moreton-in-Marsh; *s.* Histon Drayman 9th B. 410, *d.* Evenlode Chloe B. 636 *by* Ortho B. 22.

227 **R.N.**—John Pierpont Morgan, for **Aldenham Mylady.**

Class 35.—*Percheron Geldings, by registered sires, born in or before* 1930.[3]

230 **I. £20.**—John Pierpont Morgan, Wall Hall, Watford, for **Bellman**, grey, born in 1926, bred by Lord Kimberley, Kimberley House, Wymondham; *s.* Hobland Bellman B. 160, *d.* Quornmende B. 229 *by* Montrebout F. 106337.

229 **II. £10.**—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Prince**, light grey, born in 1928; *s.* Villabon B. 276, *d.* Perthe B. 178 *by* Japon F. 84819.

Hunters.

Class 36.—*Hunter Mares, with their own foals at foot.*

241 **I. £20 & Champion.[4]**—Major H. C. Meredith, Broadward Hall, Aston-on-Clun, for **7714 Stella Dallas**, brown, born in 1923 [foal *by* Bhuidhaonach], bred by R. Needham; *s.* Commodore, *d.* Koningin *by* Picton.

240 **II. £10 & R.N. for Champion.[4]**—Geoff. Kenyon, Armscote House, Stratford-on-Avon, for **Nightlight**, brown, born in 1925 [foal *by* Backstair].

243 **III. £5.**—Mrs. J. D. Paton, Hanslope Lodge, Bletchley, for **Brunnette**, brown, aged [foal *by* Roxberg].

233 **R.N.**—Major Clive Behrens, Swinton Grange, Malton, for **Swinton Honora.**

H.C.—242. **C.**—231.

Class 37.—*Hunter Mares (Novice), with their own foals at foot.*

246 **I. £20.**—Mrs. Howard Mander, Trysull Manor, Wolverhampton, for **7275 Rose Mary 5th**, brown, born in 1928 [foal *by* Boulevardier], bred by W. B. Brown, Southolme, Slingsby; *s.* Dunholm, *d.* 6570 Proud Mary *by* Proudridge.

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[1] Perpetual Silver Challenge Cup given by the British Percheron Horse Society for the best Filly in Classes 33 and 34 born in Great Britain.

[2] Perpetual Silver Challenge Cup given by the British Percheron Horse Society for the best Mare or Filly.

[3] Prizes given by the British Percheron Horse Society.

[4] Champion Gold Medal given by the Hunters' Improvement and National Light Horse Breeding Society for the best Mare four years old and upwards, which must be either registered in the Hunter Stud Book, or the entry tendered within a month of the Award.

249 **II. £10.**—Thomas & Henry Ward, Pinchinthorpe, Guisborough, for **Rainon**, dark bay, born in 1929 [foal *by* Ladore].

245 **III. £5.**—Geoff. Kenyon, Armscote, Stratford-on-Avon, for **Taffeta**, chestnut, born in 1924 [foal *by* Backstair].

Class 38.—*Hunter Colt Foals, the produce of Mares in Classes* 36 *or* 37.

252 **I. £15.**—Geoff. Kenyon, Armscote House, Stratford-on-Avon, for brown foal, born May 7; *s.* Backstair, *d.* Nightlight *by* Wax Bullet.

254 **II. £10.**—H. R. W. Mitchell, The Vale, Kirby Bedon, Norwich, for **Moonstruck**, bay, born March 17; *s.* Sky Cracker, *d.* 6638 The Bint.

255 **III. £5.**—Thomas & Henry Ward, Pinchinthorpe, Guisborough, for brown foal, born April 19; *s.* Twelve Pointer, *d.* Rainon *by* Delius.

253 **R.N.**—Geoff. Kenyon.

C.—250.

Class 39.—*Hunter Filly Foals, the produce of Mares in Classes* 36 *and* 37.

256 **I. £15.**—Major Clive Behrens, Swinton Grange, Malton, for **Swinton Helena**, bay, born April 12; *s.* Hector, *d.* 6799 Swinton Honora *by* Dunholm.

262 **II. £10.**—Major H. C. Meredith, Broadward Hall, Aston-on-Clun, for bay foal, born Feb. 9; *s.* Bhuidhaonach, *d.* 7714 Stella Dallas *by* Commodore.

261 **III. £5.**—Mrs. Howard Mander, Trysull Manor, Wolverhampton, for **Proud Rose**, bay, born March 14; *s.* Boulevardier, *d.* 7275 Rose Mary 5th *by* Dunholm.

264 **R.N.**—Mrs. J. D. Paton, Hanslope Lodge, Bletchley, Bucks.

Class 40.—*Hunter Fillies, born in* 1930.

265 **I. £20 & Champion.**[1]—Lt.-Col. T. R. Badger, Biddlesden Park, Brackley, for **7556 Mildmay 2nd**, brown, bred by W. G. Spencer, Wedgnock Park, Warwick; *s.* Perfectus, *d.* 7496 Mildmay *by* Captivation.

268 **II. £10.**—Sir John W. Buchanan-Jardine of Castlemilk, Bart., Norwood, Lockerbie, for **7649 Harmony 7th**, bay; *s.* Harmonius, *d.* 7650 Miss Colling *by* McMahon.

274 **III. £5.**—Guy Fenwick, North Luffenham, Stamford, for **Estrella**, brown; *s.* Star and Garter, *d.* 5690 Santa Gertrudis *by* Santair.

277 **R.N.**—Nickols Bros., Bythorn, Huntingdon, for **Slipper.**

H.C.—267, 272. **C.**—269, 271.

Class 41.—*Hunter Fillies, born in* 1931.

279 **I. £20.**—F. R. Bennion, Lawn Farm, Corse Lawn, Tewkesbury, for **7880 Lonely Girl**, brown; *s.* All Alone, *d.* Dainty *by* Gay Lally.

280 **II. £10.**—C. B. Chartres, Mindrum, Northumberland, for **7954 Maranda**, chestnut; *s.* Harmonius, *d.* 3916 Amanda *by* King's Beadsman.

284 **III. £5.**—George Jackson, Wychbold Court, Droitwich, for **7876 All Wych**, bay; *s.* Brigand, *d.* 7497 Red Wych *by* Ybro.

282 **R.N.**—George Dickinson, Cark Mills, Cark-in-Cartmel, for **Cark Fox Gem.**

H.C.—283. **C.**—287, 288.

Class 42.—*Hunter Fillies, born in* 1932.

302 **I. £20 & R.N. for Champion.**[1]—The Dowager Lady Penrhyn, Wicken Park, Bletchley, for **7985 Katherine**, brown; *s.* St. David, *d.* Nell *by* Chantuer.

291 **II. £10.**—F. R. Bennion, Lawn Farm, Corse Lawn, Tewkesbury, for **Cittara**, brown; *s.* St. David, *d.* Dainty *by* Gay Lally.

303 **III. £5.**—Thomas & Henry Ward, Pinchinthorpe, Guisborough, for **Belldore**, brown; *s.* Lodore, *d.* Bellicent *by* Invincible.

290 **R.N.**—Major Clive Behrens, Swinton Grange, Malton, for **Flavia.**

H.C.—289. **C.**—292, 296.

Class 43.—*Hunter Geldings, born in* 1930.

306 **I. £20.**—Mrs. J. D. Paton, Hanslope Lodge, Bletchley, for **Rocket 1588**, brown, bred by Mrs. J. Baldwin, Bleak House, Wittering, Peterborough; *s.* Roxberg, *d.* Brunnette *by* Dibs.

308 **II. £10.**—James V. Rank, Ouborough, Godstone, Surrey, for **Senegand 1629**, bay, bred by A. Victor Arkell, Ditchford, Shipston-on-Stour; *s.* Brigand, *d.* 7022 Sensation *by* Senseless.

305 **III. £5.**—John Edward Jones, Treworgan, Llangrove, Hereford, for **China Cock 1448**, bay; *s.* Irawaddy, *d.* 6889 Cardona *by* Cardonald.

307 **R.N.**—T. R. Pearson, Ednaston Hall, Derby, for **Corndavon.**

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[1] Champion Gold Medal given by the Hunters' Improvement and National Light Horse Breeding Society for the best Filly not exceeding three years old, which must be either registered in the Hunter Stud Book, or the entry tendered within a month of the Award.

Class 44.—*Hunter Geldings, born in* 1931.

813 I. £20.—John Edward Jones, Treworgan, Llangrove, Hereford, for **Wonder Bar** 1655, bay, bred by Miss Joan Lysley, Pewsham House, Chippenham; *s.* Bardsey, *d.* 7457 Sweet Pepper 2nd *by* Brandimintine.
814 II. £10.—Mrs. Howard Mander, Trysull Manor, Wolverhampton, for **Alderchime** 1592, bay, bred by R. Bromley, Hafod, Llanymynech; *s.* The Alder, *d.* 6806 Tingle *by* Lonawand.
810 III. £5.—Lt.-Col. T. R. Badger, Biddlesden Park, Brackley, for **Frost**, bay, bred by Bell & Hogg, Boroughbridge; *s.* The Winter King, *d.* 7421 Wedding Belle *by* Irawaddy.
812 R.N.—Miss R. M. Harrison, O.B.E., Maer Hall, Newcastle, Staffs., for **Robin Hood.**
H.C.—816.

Class 45.—*Hunter Colts or Geldings, born in* 1932.

820 I. £20.—Major Clive Behrens, Swinton Grange, Malton, for **Swinton Huntsman,** bay gelding; *s.* Top Covert, *d.* 6799 Swinton Honora *by* Dunholm.
829 II. £10.—Mrs. Howard Mander, Trysull Manor, Wolverhampton, for **Wishful's Last** 1697, brown colt, bred by G. P. Reinhold, Chiltern, Watlington, Oxon.; *s.* Walden, *d.* 5565 Wishful *by* Mountain Buck.
827 III. £5—Miss R. M. Harrison, O.B.E., Maer Hall, Newcastle, Staffs., for **Neville,** bay gelding; *s.* Bhuidhaonach, *d.* 6917 Tiltress *by* Tilstock.
824 R.N.—Mrs. Elsie Farnham, Finnamore, Marlow, for **Cezembre.**
H.C.—828.

Special Produce First Prizes of £3 each given by the R.A.S.E., and Second Prizes of £1 each by the Hunters' Improvement and National Light Horse Breeding Society, for the two best groups of three animals in Classes 40 *to* 45, *by the same Thoroughbred or Registered Hunter Sire. A Silver Medal was given by the H.I. & N.L.H.B.S. to the owner of the sire of the winning group, and a Bronze Medal to the owner of the sire of the second prize group.*

Sired by Brigand.

284 **All Wych,** bay filly, exhibited by George Jackson.
308 **Senegand,** bay gelding, exhibited by James V. Rank.
812 **Robin Hood,** bay gelding, exhibited by Miss R. M. Harrison, O.B.E.

Sired by Tiro.

294 **Novice,** chestnut filly, exhibited by Miss W. L. Fox.
809 **Tuneful,** chestnut gelding, exhibited by Lt.-Col. E. C. Atkins.
819 **Tiber,** chestnut colt, exhibited by Lt.-Col. E. C. Atkins.

Polo and Riding Ponies.

Class 46.—*Polo and Riding Pony Stallions, born in or before* 1930, *not exceeding* 15 *hands.*

843 I. £20 & Champion.[1]—Sir Ian Walker, Bart., Osmaston Manor, Derby, for **Tabarin** 1682, bay, born in 1922, bred by Mme. P. de Prelle de la Nieppe, Belgium; *s.* Sir Toby, *d.* Tamise *by* Talion.
837 II. £10 & R.N. for Champion.[1]—Capt. W. H. France-Hayhurst, Bostock Hall, Middlewich, for **Silverdale Loyalty** 1448, dark brown, born in 1928, bred by Herbert Bright, The Cove, Silverdale, Carnforth; *s.* Prince Friarstown [Supp. 1927], *d.* 4168 Silvery 2nd *by* Right For'ard 868.
838 III. £5.—Herbert Bright, The Cove, Silverdale, Carnforth, for **Silverdale Cheerio** 1320, bay, born in 1921, bred by the late Capt. Noel H. Wills, Miserden Park, Cirencester; *s.* Cherry Tint 1320, *d.* 4168 Silvery 2nd *by* Right For'ard 868.
841 R.N.—Capt. the Hon. C. K. Greenway, Stanbridge Earls, Romsey, Hants., for **Malice.**
H.C.—839.

Class 47.—*Polo and Riding Pony Colts, Fillies or Geldings, born in* 1932.

847 I. £20.—Capt. W. H. France-Hayhurst, Bostock Hall, Middlewich, for **Rosina 2nd** (Supp. 1932), chestnut filly; *s.* Silverdale Loyalty 1448, *d.* 6026 Rosine *by* Rosewood 1314.
851 II. £10.—Miss J. L. Young, Huish, Basingstoke, for **Talisman 2nd** (Supp. 1932), bay colt; *s.* Tabarin 1682, *d.* Mona 6th (A.M.R., p. 182) *by* Veitis.
850 III. £5.—Sir Ian Walker, Bart., Osmaston Manor, Derby, for **Gazelle** (Supp. 1932), bay filly; *s.* Tabarin 1682, *d.* Queen 4th (A.M.R., p. 407).
846 R.N.—Miss B. G. Cory-Wright, Norcott Hill, Berkhamsted, for **Fair Harriet.**
H.C.—849. C.—848.

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[1] Champion Gold Medal given by the National Pony Society for the best Stallion or Colt.

Class 48.—*Polo and Riding Pony Colts, Fillies or Geldings, born in* 1931.

355 I. £20 & Champion[1] & R.N. for Champion.[2]—CAPT. W. H. FRANCE-HAYHURST, Bostock Hall, Middlewich, for **Sunshine 6th** (Supp. 1931), chestnut filly; *s.* Silverdale Loyalty 1448, *d.* 4900 Coronet *by* Little Corona 814.

361 II. £10 & R.N. for Champion.[1]—SIR IAN WALKER, BART., Osmaston Manor, Derby, for **Fly by Night** (Supp. 1931), bay filly; *s.* Tabarin 1682, *d.* Dusk 2nd (A.M.R., p. 284) *by* Hanover Square.

356 III. £5.—TRESHAM GILBEY, Whitehall, Bishop's Stortford, for **Marble** (Y.S.R., p. 108), chestnut colt; *s.* Bridgewater, *d.* Blue Stone (A.M.R., p. 124) *by* Reform 1002.

359 R.N.—SIR IAN WALKER, BART., for **Falnie.**

C.—354, 357.

Class 49.—*Polo and Riding Pony Fillies or Geldings, born in* 1930.

367 I. £20.—SIR IAN WALKER, BART., Osmaston Manor, Derby, for **Eugene** (Supp. 1931), brown gelding; *s.* Tabarin 1682, *d.* 4633 Zither *by* Newburgh.

366 II. £10.—SIR IAN WALKER, BART., for **Fazana** (Supp. 1931), chestnut filly; *s.* Tabarin 1682, *d.* Rochette (A.M.R., p. 377) *by* Amadis.

363 III. £5.—MISS B. G. CORY-WRIGHT, Norcott Hill, Berkhamsted, for **Cassia 2nd** (Y.S.R., p. 93), bay filly; *s.* Gold Eagle (Y.S.R., p. 36), *d.* Spice (A.M.R., p. 159).

365 R.N.—MISS E. V. P. HODSON, Abnalls, Lichfield, for **Tom Tit 2nd.**

Class 50.—*Polo and Riding Pony Mares with their own foals at foot, not exceeding* 15 *hands.*

371 I. £20 & Champion.[2]—CAPT. W. H. FRANCE-HAYHURST, Bostock Hall, Middlewich, for **6026 Rosine,** chestnut [foal *by* Four Up 1038]; *s.* Rosewood 1314, *d.* 5032 Juliet 2nd *by* Sandiway 121.

368 II. £10 & R.N. for Champion[2]—HERBERT BRIGHT, The Cove, Silverdale, Carnforth, for **4168 Silvery 2nd,** bay, born in 1914 [foal *by* Silverdale Bowtint], bred by the late Sir John Barker, Bishop's Stortford; *s.* Right For'ard 368, *d.* 1631 Silver Queen *by* Sandiway 121.

372 III. £5.—TRESHAM GILBEY, Whitehall, Bishop's Stortford, for **Miss Graham** (A.M.R., p. 127), grey [foal *by* Crathorne].

373 R.N.—CAPT. THE HON. C. K. GREENWAY, Stanbridge Earls, Romsey, Hants., for **Raheene.**

369 H.C. & Champion.[3]—CAPT. FIELDING-JOHNSON, Manor Farm, Compton Bassett.

Welsh Mountain Ponies.

Class 51.—*Welsh Mountain Pony Stallions, born in or before* 1930, *not exceeding* 12 *hands.*

376 I. £15.—TOM JONES EVANS, Dinchope Farm, Craven Arms, Shropshire, for **Grove Sprightly 1036,** grey, born in 1918, bred by Mrs. H. D. Greene, Grove, Craven Arms; *s.* Shooting Star 78, *d.* 4431 Grove Sprite 2nd *by* Grove Ballistite 200.

379 II. £10.—TOM JONES EVANS AND MISS N. MATHIESON, Dinchope Farm, Craven Arms, and Gatesheath Cottage, Tattenhall, Chester, for **Grove Will-o'-the-Wisp 1260,** grey, born in 1923, bred by Mrs. H. D. Greene, Grove, Craven Arms; *s.* Shooting Star 78, *d.* 3017 Grove Twilight *by* Grove Ballistite 200.

375 III. £5.—MISS M. BRODRICK, Coed Coch, Abergele, for **Coed Coch Eog 1545,** grey, born in 1930; *s.* Llwyn Satan 1325, *d.* 8257 Coed Coch Eirlys *by* Stretton Sweep 246.

378 R.N.—TOM JONES EVANS AND MISS N. MATHIESON, for **Craven Black and White.**

Class 52.—*Welsh Mountain Pony Mares, with their own foals at foot, not exceeding* 12 *hands.*

381 I. £15.—TOM JONES EVANS, Dinchope Farm, Craven Arms, Shropshire, for **7846 Grove Ladybird,** brown, born in 1921 [foal *by* Craven Cyrus 1441], bred by Mrs. H. D. Greene, Grove, Craven Arms; *s.* Shooting Star 78, *d.* 3480 Forest Lady Grey *by* Beulah Light 282.

384 II. £10.—MISSES MAY AND SUMMERS, The Manor House, Rodney Stoke, Cheddar, Somerset, for **8568 Towyvale Delight,** brown, born in 1920 [foal *by* Endymion], bred by the late W. S. Miller, Forest Lodge, Brecon; *s.* Forest Chief 944, *d.* Forest Brave Lulu.

380 III. £5.—MISS M. BRODRICK, Coed Coch, Abergele, for **8589 Coed Coch Seren,** dark brown, born in 1925 [foal *by* Revolt 293]; *s.* Grove Sharp Shooter 1259, *d.* 8257 Coed Coch Eirlys *by* Stretton Sweep 246.

382 R.N.—MRS. INGE, Thorpe, Tamworth, for **Brynhir Black Star.**

H.C.—383.

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[1] Champion Silver Medal given by the National Pony Society for the best Filly.

[2] Champion Gold Medal given by the National Pony Society for the best Mare or Filly.

[3] Bronze Medal given by the National Pony Society for the best Foal in Class 50 entered in the Supplement to the National Pony Stud Book.

Riding Classes.

HUNTERS.

Class 53.—*Hunter Mares or Geldings, born in* 1929.

413 I. £15.—PHILIP I. PEASE, Sledwich, Barnard Castle, for **Blue Flare**, chestnut gelding.
402 II. £10.—GEOFF. KENYON, Armscote House, Stratford-on-Avon, for **Perfect Lad 1511**, bay gelding.
390 III. £5.—MISS BARBARA BLACKWELL, Oxhey Place, Watford, for **Simple Simon**, chestnut gelding.
419 IV. £3.—SIR IAN WALKER, BART., Osmaston Manor, Derby, for **Foxglove**, brown mare.
400 R.N.—JOHN EDWARD JONES, Treworgan, Llangrove, Hereford, for **Cupid**.
H.C.—392. C.—389, 409, 414, 416, 421.

Class 54.—*Hunter Mares or Geldings (Novice), born in or before* 1929, *up to from* 12 *to* 14 *stones.*

435 I. £15.—GEORGE JACKSON, Wychbold Court, Droitwich, for **Don Bradman**, chestnut gelding, born in 1926.
440 II. £10.—CAPT. SIR HAROLD NUTTING, BART., Quenby Hall, Leicestershire, for **Cheerful**, bay gelding, born in 1925.
417 III. £5.—RONALD TREE, Kelmarsh Hall, Northampton, for **Seminole**, bay gelding, born in 1927.
413 IV. £3.—PHILIP I. PEASE, for **Blue Flare**. (See Class 53).
434 R.N.—MRS. R. FARQUHAR, Gaddesby, Leicester, for **The Villa**.
H.C.—453. C.—403, 419, 455.

Class 55.—*Hunter Mares or Geldings (Novice), born in or before* 1929, *up to more than* 14 *stones.*

431 I. £15.—JOHN DRAGE, Chapel Brampton, Northampton, for **Sportsman**, bay gelding, born in 1927.
423 II. £10.—MAJOR W. HARCOURT WEBB, Spring Grove, Bewdley, for **Jorrocks**, bay gelding, born in 1926.
458 III. £5.—THE COUNTESS OF HARRINGTON, Elvaston Castle, Derby, for **Brandy**, chestnut gelding, born in 1926.
389 IV. £3.—CAPT. ADRIAN BETHELL, Rise Park, Hull, for **Royal Rufus**, chestnut gelding, born in 1929.

Class 56.—*Hunter Mares or Geldings, born in or before* 1928, *up to not more than* 14 *stones, suitable to carry a lady, and to be ridden by a lady, side-saddle.*

439 I. £15.—THOMAS MARTON, Salton Manor, Sinnington, Yorks., for **Duncomb**, bay gelding, born in 1928.
425 II. £10.—MRS. STANLEY BARRATT, Great Westwood, King's Langley, for **Middleton**, brown gelding, born in 1927.
440 III. £5.—CAPT. SIR HAROLD NUTTING, for **Cheerful**. (See Class 54).
461 IV. £3.—W. H. FOSTER, Stonecroft, Barnetby, Lincs., for **Cottage Pie** (Supp. No. 1531) brown gelding, born in 1926.
417 R.N.—RONALD TREE, for **Seminole**. (See Class 54).
H.C.—438. C.—428, 453.

Class 57.—*Hunter Mares or Geldings, born in or before* 1929, *up to from* 12 *to* 13.7 *stones.*

435 I. £20.—GEORGE JACKSON, for **Don Bradman**. (See Class 54).
440 II. £15.—CAPT. SIR HAROLD NUTTING, BART., for **Cheerful**. (See Class 54).
464 III. £10.—HARRY HENSHALL, Queen's Villa, Ashley Road, Bowdon, Cheshire, for **Park Lane** (Supp. No. 1582), chestnut gelding, born in 1926.
433 IV. £5.—CHARLES DRAGE, Chapel Brampton, Northampton, for **Mr. Brinton**, chestnut gelding, born in 1926.
461 V. £3.—W. H. FOSTER, for **Cottage Pie**. (See Class 56).
413 R.N.—PHILIP I. PEASE, for **Blue Flare**. (See Class 53).
H.C.—462.

Class 58.—*Hunter Mares or Geldings, born in or before* 1929, *up to more than* 13.7 *and not more than* 15 *stones.*

465 I. £20.—MRS. E. M. VAUGHAN, Blackladies, Brewood, Stafford, for **Hecland** (Supp. No. 1412), chestnut gelding, born in 1925.
439 II. £15.—THOMAS MARTON, for **Duncomb**. (See Class 56).
425 III. £10.—MRS. STANLEY BARRATT, for **Middleton**. (See Class 56).
418 IV. £5.—RONALD TREE, Kelmarsh Hall, Northampton, for **Shirley**, chestnut gelding, born in 1927.
434 V. £3.—MRS. R. FARQUHAR, Gaddesby, Leicester, for **The Villa**, brown gelding, born in 1928.
466 R.N.—RICHARD LEITCH, Lennelhill, Coldstream, for **Gold Mint**.
H.C.—423.

Class 59.—*Hunter Mares or Geldings, born in or before* 1929, *up to more than* 15 *stones.*

472 I. £20.—The Earl of Rosebery, Mentmore, Leighton Buzzard, for **Sunkist**, chestnut gelding, born in 1927.
404 II. £15.—Geoff. Kenyon, Armscote House, Stratford-on-Avon, for **James Pigg**, brown gelding, born in 1927.
431 III. £10.—John Drage, for **Sportsman**. (See Class 55).
416 IV. £5.—Ronald Tree, Kelmarsh Hall, Northampton, for **Safety First**, chestnut gelding, born in 1929.
471 V. £3.—G. B. Radcliffe, Pool Bank, Tarvin, Chester, for **Friendship**, brown gelding, born in 1927.
470 R.N.—W. H. Midwood, Calveley Hall, Tarporley, for **Golden Dawn**.
C.—443.

HACKS.

Class 60.—*Hack Mares or Geldings.*

488 I. £15.—Lt.-Col. Sir Archibald Weigall, K.C.M.G., Englemere, Ascot, for **Radiant**, bay gelding, born in 1925.
429 II. £10.—Mrs. Philip Dunne, Chadshunt, Warwickshire, for **Sally**, chestnut mare, born in 1927.
399 III. £5.—W. J. Straiton, Hunting and Polo Stables, Knutsford, for **Silver Sword**, grey gelding, born in 1924.
474 IV. £3.—Mrs. F. M. Broomfield, Longdown Chase, Hindhead, for **Jonathan Buttall**, brown gelding, born in 1928.
477 R.N.—Miss Jill Hermon-Erriman, Ridge Hill House, Etchinghill, Kent, for **Wonder Bar**.

Class 61.—*Hack Mares or Geldings, suitable to carry a lady and to be ridden by a lady side-saddle.*

483 I. £15 & Champion.[1]—Lt.-Col. Sir Archibald Weigall, K.C.M.G., for **Radiant**. (See Class 60).
429 II. £10 & R.N. for Champion.[1]—Mrs. Philip Dunne, for **Sally**. (See Class 60).
399 III. £5.—W. J. Straiton, for **Silver Sword**. (See Class 60).
477 IV. £3.—Miss Jill Hermon-Erriman, Ridge Hill House, Etchinghill, Kent, for **Wonder Bar**, bay gelding, born in 1928.
450 R.N.—Major W. R. Revel-Smith, Hatton Hall, Derbyshire, for **Patriarch**.

CHILDREN'S PONIES.

Class 62.—*Pony Mares or Geldings, not exceeding* 13 *hands, to be ridden by children born in or after* 1923.

494 I. £10.—Mrs. Inge, Thorpe, Tamworth, for **Tan-y-Bwlch Rhydd**, grey gelding, born in 1929.
496 II. £5.—Andrew Massarella, Belmont, Bentley, Doncaster, for **Steel Dust**, grey gelding, born in 1923.
491 III. £3.—Mrs. M. V. Hughes, Dingley Lodge, Market Harborough, for **Zara**, chestnut mare, born in 1928.
490 R.N.—Mrs. M. V. Hughes, for **Gwynno**.
H.C.—498. C.—486, 495.

Class 63.—*Pony Mares or Geldings, over* 13 *and not exceeding* 14 *hands, to be ridden by children born in or after* 1920.

517 I. £10.—Miss Peggy Pacey, Clifton Hall, Rugby, for **Lapis Lazuli**, bay mare, born in 1925.
501 II. £5.—William Benson, Harrowby Fields, Grantham, for **Solid Silver**, grey mare, born in 1928.
507 III. £3.—Miss M. Dunne, Gatley Park, Kingsland, Herefordshire, for **Gold Flake**, chestnut mare, born in 1927.
516 R.N.—Miss Joanne Moyses, The Croft, Church Lane, Handsworth Wood, Birmingham, for **Peter**.
H.C.—503. C.—512, 521.

Class 64.—*Pony Mares or Geldings, over* 14 *and not exceeding* 15 *hands, to be ridden by children born in or after* 1917.

532 I. £10.—Miss Peggy Pacey, Clifton Hall, Rugby, for **Snap Dragon**, bay gelding, born in 1925.
525 II. £5.—Miss Barbara Talbot Cliff, The Grove, Scawby, Brigg, for **Bramble**, bay mare, born in 1927.
527 III. £3.—Charles E. Edwards, Mount Seifton, Craven Arms, for **Three Star**, brown mare, born in 1929.
H.C.—536. C.—530, 531.

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[1] Silver Challenge Cup given by a Member of the R.A.S.E. for the best Hack.

Driving Classes.

SINGLE HARNESS.

Class 65.—*Stallions, Mares or Geldings (Novice), not exceeding* 14 *hands.*

541 **I. £15.**—Robert Black, Maiden Erlegh Stud Farm, Reading, for **Lord Erlegh**, bay roan gelding, born in 1929.
554 **II. £10.**—Mrs. Edgar Henriques, Fernholm, Hesketh Park, Southport, for **26829 Fleetwood Zephyr**, bay mare, born in 1928.
568 **III. £5.**—William S. Miller, Balmanno Castle, Bridge of Earn, for **Cassilis Highland Mighty**, brown mare, born in 1927.
579 **R.N.**—H. Stafford, Victoria Road, Grappenhall, Warrington, for **Mabel Southworth.**
H.C.—553. **C.**—567.

Class 66.—*Stallions, Mares or Geldings (Novice), over* 14 *and not exceeding* 15 *hands.*

543 **I. £15.**—Robert Black, Maiden Erlegh Stud Farm, Reading, for **Lavington Roma**, chestnut mare, born in 1928.
551 **II. £10.**—A. R. Fish, Holme Mead, Hutton, New Longton, Preston, for **26785 Glenavon Altitude**, bay mare, born in 1928.
580 **III. £5.**—Thomas Evans, Highfield, Sketty, Swansea, for **Gallant Knight**, bay gelding, born in 1926.
550 **R.N.**—A. R. Fish, for **Glenavon Grace.**
H.C.—561.

Class 67.—*Stallions, Mares or Geldings (Novice), over* 15 *hands.*

552 **I. £15.**—A. R. Fish, Holme Mead, Hutton, New Longton, Preston, for **Glenavon Tradition G. 769**, bay gelding, born in 1928.
581 **II. £10.**—George McDonald, 4, Larch Road, Dumbreek, Glasgow, for **Ornamentation 14625**, bay stallion, born in 1926.
562 **III. £5.**—Paul Hoffmann, 4, Cardigan Mansions, Richmond Hill, Surrey, for **27056 Orford Radium**, dark chestnut mare, born in 1923.
544 **R.N.**—Robert Black, Maiden Erlegh Stud Farm, Reading, for **Cimarron.**

Class 68.—*Stallions, Mares or Geldings, not exceeding* 13.2 *hands.*

547 **I. £15.**—Arthur R. Fish, Holme Mead, Hutton, New Longton, Preston, for **Barcroft Belle**, bay mare, born in 1927.
571 **II. £10.**—William S. Miller, Balmanno Castle, Bridge of Earn, for **Jix G. 625**, bay gelding, born in 1925.
588 **III. £5.**—J. E. Rushworth, Eskdale, Bargate, Grimsby, for **Habrough Wattie G. 702**, brown gelding, born in 1926.
579 **R.N.**—H. Stafford, Victoria Road, Grappenhall, Warrington, for **Mabel Southworth.**
H.C.—564. **C.**—567.

Class 69.—*Stallions, Mares or Geldings, over* 13.2 *and not exceeding* 14 *hands.*

546 **I. £15.**—Robert H. McColl, 9, Sherbrooke Avenue, Pollokshields, Glasgow, for **Braishfield Sonnet**, chestnut mare, born in 1922.
576 **II. £10.**—Frank C. Minoprio, Broadlands, Ascot, for **Mickey Mouse G. 737**, bay gelding, born in 1927.
553 **III. £5.**—Mrs. Edgar Henriques, Fernholm, Hesketh Park, Southport, for **Fleetwood Live Fuse**, brown gelding, born in 1926.

Class 70.—*Stallions, Mares or Geldings, over* 14 *and not exceeding* 15 *hands.*

558 **I. £15.**—Mrs. Edgar Henriques, Fernholm, Hesketh Park, Southport, for **26770 Fleetwood Nanette**, chestnut mare, born in 1925.
540 **II. £10.**—James Agate, 74, Kensington Gardens Square, London, W.2. for **27119 Black Tulip**, black mare, born in 1928.
551 **III. £5.**—A. R. Fish, for **Glenavon Altitude.** (See Class 66).
589 **R.N.**—Mrs. A. C. King, Braishfield Manor, Romsey, Hants., for **The Ringer.**
H.C.—591.

Class 71.—*Stallions, Mares or Geldings, over* 15 *hands.*

583 **I. £15.**—Nigel C. Colman, M.P., 49, Grosvenor Square, London, W.1, for **26523 Modern Maid**, bay mare, born in 1926.
552 **II. £10.**—A. R. Fish, for **Glenavon Tradition.** (See Class 67).
566 **III. £5.**—Paul Hoffmann, 4, Cardigan Mansions, Richmond Hill, Surrey, for **26628 Orford Eclipse**, dark chestnut mare, born in 1926.
577 **R.N.**—Frank C. Minoprio, Broadlands, Ascot, for **Pollux.**

DOUBLE HARNESS.

Class 72.—*Stallions, Mares or Geldings.*

572 I. £15.—WILLIAM S. MILLER, Balmanno Castle, Bridge of Earn, for Mr. Cinders, brown gelding, born in 1928, and Flight Cadet G. 696, brown gelding, born in 1926.

542 & 545 II. £10.—ROBERT BLACK, Maiden Erlegh Stud Farm, Reading, for Talke Sunshine, bay mare, born in 1925, and Julia Southworth, bay mare.

554 & 557 III. £5.—MRS. EDGAR HENRIQUES, for Fleetwood Zephyr (See Class 65), and 26824 Fleetwood Golden Rain, bay mare, born in 1928.

591 & 592 R.N.—MRS. A. C. KING, Braishfield Manor, Romsey, Hants., for The Raider and Aurora.

H.C.—550 & 551.

TANDEMS.

Class 73.—*Stallions, Mares or Geldings.*

554 & 557 I. £15.—MRS. EDGAR HENRIQUES, for Fleetwood Zephyr and Fleetwood Golden Rain. (See Class 72).

589 & 591 II. £10.—MRS. A. C. KING, for The Ringer, brown gelding, born in 1922 and The Raider, brown gelding, born in 1922.

542 & 545 III. £5.—ROBERT BLACK, for Talke Sunshine and Julia Southworth. (See Class 72).

562 & 566 R.N.—PAUL HOFFMANN, for Orford Radium and Orford Eclipse.

H.C.—577 & 578.

CATTLE.

Unless otherwise stated the Prizes in each Class for Cattle are as follows : First Prize, £15 ; Second Prize, £10 ; Third Prize, £5 ; Fourth Prize, £4 ; Fifth Prize, £3.

Shorthorns.

Class 74.—*Shorthorn Bulls, born in or before* 1930.

658 I., R.N. for Champion[1] & R.N. for Champion.[2]—ALBERT JAMES MARSHALL, Bridgebank, Stranraer, for Cruggleton Searchlight 236500, red roan, born Aug. 19, 1929 ; *s.* Lutwyche Grafter 209357, *d.* 99687 Secret Stella *by* Bridgebank Paymaster 154308.

652 II.—THE BAPTON SHORTHORN CO., LTD., Bapton, Cudham, Sevenoaks, for Calrossie Ringleader 235690, dark roan, born Dec. 3, 1929, bred by Capt. John MacGillivray, Calrossie, Nigg, Ross-shire ; *s.* Collynie Royal Leader 188656, *d.* 99261 Calrossie Beres Butterfly *by* Naemoor Ian 209839.

660 III.—CHARLES ROBINSON, Tanyard Farm, Ringway, Altrincham, for Schivas Domain 240172, roan, born April 18, 1929, bred by James Burr, Mains of Schivas, Ellon, Aberdeenshire ; *s.* Collynie Barnone 22200, *d.* 69069 Collynie Princess Royal 2nd *by* Collynie Ear Lavender 170449.

Class 75.—*Shorthorn Bulls, born on or between January* 1 *and March* 31, 1931.[3]

664 I.—CHARLES A. LINZEE-GORDON, Cluny Castle, Aberdeenshire, for Calrossie Scout Leader 249388, dark roan, born March 22, bred by Capt. John MacGillivray, Calrossie, Nigg ; *s.* Collynie Royal Leader 188656, *d.* 99261 Calrossie Beres Butterfly *by* Naemoor Ian 209839.

665 II.—ALBERT JAMES MARSHALL, Bridgebank, Stranraer, for Cruggleton Alphy 250080, roan, born Feb. 22 ; *s.* Cruggleton Nathan 229479, *d.* 15699 Frivolous Augusta *by* Cluny Royal Mint 135792.

Class 76.—*Shorthorn Bulls, born on or between April* 1 *and December* 31, 1931.

667 I.—H.R.H. THE PRINCE OF WALES, K.G., Grove Farm, Lenton, Nottingham, for Cambus Matchmaker 249404, red, born June 16, bred by Alexander & Addie, Newbiggin, Cambus, Stirling ; *s.* Aldie Air Raid 227618, *d.* 48130 Haselor Broadhooks *by* Collynie King Lavender 148038.

675 II.—ALBERT JAMES MARSHALL, Bridgebank, Stranraer, for Cruggleton Bayardo 250042, dark roan, born July 1 ; *s.* Cruggleton Colonel 236411, *d.* 120955 Camelia Broadhooks *by* Bridgebank Rosedene 213883.

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[1] Champion Prize of £20 given by the Shorthorn Society for the best Bull. A Silver Medal was given by the Shorthorn Society to the Breeder of the Champion Bull.

[2] Silver Challenge Cup given by the Argentine Shorthorn Breeders' Association for the best Bull.

[3] Prizes given by the Shorthorn Society.

673 III.—Arthur Green, Highfield, Denton, Ilkley, Yorks., for **Denton Leader 250277**, roan, born Sept. 9; *s.* Denton Rex 229718, *d.* 118600 Denton Crystal *by* Staff Officer 226629.

668 IV.—J. Baird & Co. (Falkirk), Ltd., Bantaskin, Falkirk, for **Crieffvechter Desperado** 249960, white, born May 30, bred by W. D. Dron, Crieffvechter, Crieff; *s.* Aldie Air Raid 227618, *d.* 2385 Jessica *by* Gloaming Star 136732.

666 R.N.—His Majesty The King, The Royal Farms, Windsor, for **Millhills Nigel.**
H.C.—677, 679. C.—672, 678.

Class 77.—*Shorthorn Bulls, born on or between January* 1 *and March* 31, 1932.[1]

682 I., Champion,[2] Champion,[3] & Champion[4].—The Bapton Shorthorn Co., Ltd., Bapton, Cudham, Sevenoaks, for **Bapton Ringleader**, dark roan, born Jan. 19; *s.* Calrossie Ringleader 235690, *d.* 44438 Princess Margaret *by* Billington Snowstorm 154027.

687 II.—Duncan M. Stewart, Millhills, Crieff, Perthshire, for **Millhills Opal**, white, born Jan. 18; *s.* Elmley Golden Rain 230028, *d.* 79935 Millhills Lavender 5th *by* Collynie Royal Cup 188655.

689 III.—Lady Wills, Coombe Lodge, Blagdon, Bristol, for **Rickford White Star**, white, born March 15; *s.* Collynie Climax 243060, *d.* 114600 Rickford Crocus 6th *by* Cudham Prospect 228718.

690 R.N.—Capt. R. G. M. Wilson, Lady Margaret Road, Cambridge, for **Iceni Golden Orange**, roan, born Feb. 3; *s.* Stonelands Marmion 247374, *d.* 85812 Denton Orange Blossom 3rd *by* Collynie Golden Key 170455.
H.C.—680. C.—685.

682, 738, 748 Special I[5].—The Bapton Shorthorn Co., Ltd., for **Bapton Ringleader, Bapton Princess Royal 11th** and **Bapton Princess Royal 12th.**

658, 715, 717 Special II.[5]—Albert James Marshall, for **Cruggleton Searchlight, Cruggleton Beverley** and **Augusta Melissa.**

665, 675, 706 R.N. for Specials.[5]—Albert James Marshall, for **Cruggleton Alphy, Cruggleton Bayardo** and **Cruggleton Prince Howard.**

Class 78.—*Shorthorn Bulls, born on or between April* 1 *and June* 30, 1932.

701 I.—Peter Forbes Jones, Dunmore Park, Larbert, for **Larbert Clipper King**, white, born April 2; *s.* Cluny Ian Augustus 229134, *d.* 109398 Larbert Clipper 13th *by* Balmuchy Baronet 213217.

693 II.—J. Baird & Co. (Falkirk), Ltd., Bantaskin, Falkirk, for **Killineer Pasha**, red, born April 19, bred by J. F. Barr, Killineer House, Drogheda; *s.* Killineer Ringleader 238204, *d.* 96560 Orchard Rosebud 8th *by* Basildon Proud Actor 204975.

694 III.—Joseph Barnes, Barugh Syke, Wigton, for **Baron Bridekirk 122nd**, red, born April 14; *s.* Rothiebrisbane Bulwark 202379, *d.* 33167 Bridekirk 115th *by* Inschfield Jealous Ploughboy 164208.

706 IV.—Albert James Marshall, Bridgebank, Stranraer, for **Cruggleton Prince Howard**, roan, born June 6; *s.* Cruggleton Prince Henry 236481, *d.* 131183 Princess Clovelly *by* Bridgebank Rosedene 213883.

704 V.—Norman N. Lee, Stonelands, Arncliffe, Skipton-in-Craven, for **Stonelands White Eagle**, white, born April 14; *s.* Collynie Red Eagle 214703, *d.* 120649 Glastullich Lady Buttercup *by* Naemoor Jasper 217761.

698 R.N.—William W. Frank, Walshford, Wetherby, for **Walshford Autocrat.**
H.C.—705. C.—695, 700.

Class 79.—*Shorthorn Bulls, born on or between July* 1, *and December* 31, 1932.[1]

715 I.—Albert James Marshall, Bridgebank, Stranraer, for **Cruggleton Beverley**, dark roan, born Aug. 28; *s.* Cruggleton Colonel 236411, *d.* 120952 Brenda Blythesome *by* Balcairn Celt 220695.

707 II.—Major Clive Behrens, Swinton Grange, Malton, for **Swinton Broadhooks Captain**, roan, born Aug. 6; *s.* Calrossie Royal Conqueror 235696, *d.* 82562 Swinton Princess Broadhooks 3rd *by* King Pippin 191134.

714 III.—Albert James Marshall, for **Cruggleton Archaic**, dark roan, born July 26; *s.* Cruggleton Searchlight 236500, *d.* 52246 Augusta Faustina *by* Balcairn Baronet 158566.

711 R.N.—L. V. Garland, Greenbank, The Towans, Hayle, Cornwall, for **Towan Sportsman.**
H.C.—709, 718.

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[1] Prizes given by the Shorthorn Society.

[2] Champion Prize of £20 given by the Shorthorn Society for the best Bull. A Silver Medal was given by the Shorthorn Society to the Breeder of the Champion Bull.

[3] Silver Challenge Cup given by the Argentine Shorthorn Breeders' Association for the best Bull.

[4] The "Brothers Colling" Memorial Perpetual Challenge Cup presented through the Durham Agricultural Committee for the best Shorthorn.

[5] Special Prizes of £15 First Prize and £10 Second Prize given by the Shorthorn Society for the best groups of three animals bred by Exhibitor.

Class 80.—*Shorthorn Cows, in-milk, born in or before* 1929.

717 **I., Champion[1] & R.N. for Champion.[2]**—ALBERT JAMES MARSHALL, Bridgebank, Stranraer, for 99582 **Augusta Melissa,** red roan, born March 2, 1927, calved June 16, 1933; *s.* Bridgebank Zev 205512, *d.* 27227 Cudham Augusta 8th *by* Clun Sir Augustus 141658.

716 **II.**—THE BAPTON SHORTHORN CO., LTD., Bapton, Cudham, Sevenoaks, for 83797 **Bapton Princess Royal 3rd,** red, born May 10, 1926, calved Feb. 4, 1933, bred by Sir Cecil Chubb, Bart., Bapton Manor, Wilts.; *s.* Cluny Prince Regent 179639, *d.* 44438 Princess Margaret *by* Billington Snowstorm 154027.

720 **III.**—H. WOOF, Clawthorpe Hall, Burton, Carnforth, for 114813 **Clawthorpe Sweet Rose,** dark roan, born Aug. 24, 1928, calved Jan. 18, 1933, bred by William Woof, Clawthorpe Hall; *s.* Rosemary's Renown 218752, *d.* Rosebud *by* Smiling Yet 183640.

Class 81.—*Shorthorn Heifers, in-milk, born in* 1930.

721 **I. & R.N. for Champion.[1]**—CHARLES A. LINZEE-GORDON, Cluny Castle, Aberdeenshire, for 126703 **Cluny Augusta 29th,** dark roan, born Jan. 21, calved Sept. 9, 1932, bred by Lady Cathcart, Cluny Castle; *s.* Bruiach Ian 214009, *d.* 71720 Cluny Augusta 21st *by* Brawith Chieftain 187661.

724 **II.**—WILLIAM MCNAIR SNADDEN, The Coldoch, Blair Drummond, Stirling, for 130764 **Calrossie Roan Flora,** roan, born Jan. 27, calved Nov. 6, 1932, bred by Capt. John MacGillivray, Calrossie, Nigg; *s.* Naemoor Gaffer 192364, *d.* 27018 Calrossie Twin Flora *by* Sentinel Star 159279.

722 **III.**—ALBERT JAMES MARSHALL, Bridgebank, Stranraer, for 131181 **Pavetta Goldie,** white, born Oct. 23, calved Feb. 11, 1933; s. Bridgebank Vulcan 221490, *d.* 110578 Pandora Goldie *by* Lutwyche Grafter 209353.

723 **R.N.**—J. PERCY RAYNAR, Bilton Hall, York, for **Biltonhall Princess Royal 3rd.**
H.C.—726.

Class 82.—*Shorthorn Heifers, born in* 1931.

737 **I.**—WILLIAM MCNAIR SNADDEN, The Coldoch, Blair Drummond, Stirling, for 143420 **Larmie's Joy,** red, born March 29, bred by John Steel, Westerton of Cowie, Bannockburn; *s.* Aldie Air Raid 227618, *d.* 123446 Clippers Alarm *by* Calrossie Alarm Post 221718.

732 **II.**—CHARLES A. LINZEE-GORDON, Cluny Castle, Aberdeenshire, for 136824 **Cluny Rosewood 20th,** red, born April 2, bred by Lady Cathcart, Cluny Castle; *s.* Glastullich Sirdar 237378, *d.* 71729 Cluny Rosewood 7th *by* Brawith Chieftain 187661.

736 **III.**—R. LAIDLAW SMITH, Pittodrie, Pitcaple, Aberdeenshire, for 136571 **Schivas Lady Broadhooks,** red, born March 29, bred by James Burr, Mains of Schivas, Ellon; *s.* Collynie Barnone 222200, *d.* 56541 Collynie Broadhooks 9th *by* Balcairn White Eagle 158591.

727 **R.N.**—THE BAPTON SHORTHORN CO., LTD., Bapton, Cudham, Sevenoaks, for **Bapton Crocus 19th.**
H.C.—731. **C.**—734.

Class 83.—*Shorthorn Heifers, born on or between January* 1 *and March* 31, 1932.

738 **I.**—THE BAPTON SHORTHORN CO., LTD., Bapton, Cudham, Sevenoaks, for **Bapton Princess Royal 11th,** dark roan, born Jan. 29; *s.* Calrossie Ringleader 235690, *d.* 83797 Bapton Princess Royal 3rd *by* Cluny Prince Regent 179639.

740 **II.**—MISS A. S. BROCKLEBANK, Wing Grange, Oakham, for **Wing Broadhooks 2nd,** dark roan, born Jan. 26; *s.* Wing Royal Sportsman 248056, d. 91607 Haselor Broadhooks 4th *by* Rothiebrisbane Bulwark 222379.

745 **III.**—DUNCAN M. STEWART, Millhills, Crieff, Perthshire, for **Millhills Marchioness 3rd,** red, born Jan. 5; *s.* Royal Defiance 240020, *d.* 113204 Millhills Marchioness *by* Millhills Diamond 157771.

744 **R.N.**—CHARLES A. LINZEE-GORDON, Cluny Castle, Aberdeenshire, for **Cluny Pauline 36th.**
H.C.—739. **C.**—743.

Class 84.—*Shorthorn Heifers, born on or between April* 1 *and December* 31, 1932.

756 **I.**—DUNCAN M. STEWART, Millhills, Crieff, Perthshire, for **Cherrywood 4th,** white, born April 5; *s.* Royal Defiance 240020, *d.* 102326 Cherrywood 3rd *by* Naemoor Ironclad 209846.

748 **II.**—THE BAPTON SHORTHORN CO., LTD., Bapton, Cudham, Sevenoaks, for **Bapton Princess Royal 12th,** dark roan, born July 15; *s.* Calrossie Ringleader 235690, *d.* 71907 Princess Alice *by* Cluny Prince Regent 179639.

758 **III.**—CAPT. R. G. M. WILSON, Lady Margaret Road, Cambridge, for **Iceni Eliza 2nd,** white, born July 5; *s.* Stonelands Marmion 247374, *d.* 115950 Ena Eliza 3rd *by* Double Event 180293.
H.C.—746. **C.**—747, 754.

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[1] Champion Prize of £20 given by the Shorthorn Society for the best Cow or Heifer. A Silver Medal was given by the Shorthorn Society to the Breeder of the Champion Cow or Heifer.

[2] The "Brothers Colling" Memorial Perpetual Challenge Cup presented through the Durham Agricultural Committee for the best Shorthorn.

Herefords.

Class 85.—*Hereford Bulls, born on or before August* 31, 1930.

759 **I., Champion[1] & R.N. for Champion.[2]**—PERCY E. BRADSTOCK, Free Town, Tarrington, Herefordshire, for **Eyton Taurus 49201**, born Oct. 30, 1927, bred by E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shrewsbury; *s.* Lion 32709, *d.* Eyton Dowager 7th *by* Wormington Commodore 41834.

761 **II. & R.N. for Champion.[1]**—EDWARD WEBB & SONS (STOURBRIDGE), LTD., Astwood Farm, Stoke Works, Bromsgrove, for **Wickton President 2nd 52674**, born Jan. 6, 1930, bred by F. J. Newman, Lower Wickton, Leominster; *s.* Crossways Emeralute 44726, *d.* Pink Pansy *by* Patchwork 34099.

Class 86.—*Hereford Bulls, born on or between September* 1, 1930, *and August* 31, 1931.

764 **I.**—CHARLES HENRY MORRIS, Weston Court, Pembridge, for **Wickton Playful 2nd 54039**, born May 10, 1931, bred by F. J. Newman, Lower Wickton, Leominster; *s.* Crossways Emeralute 44726, *d.* Potency 2nd *by* Patchwork 34099.

762 **II.**—LORD CAWLEY, Berrington Hall, Leominster, for **Shelderton Lion 53827**, born Dec. 7, 1930, bred by G. Makelin, Shelderton, Aston-on-Clun; *s.* Gobion Prince 49295, *d.* Wintercott Lovely *by* Brampton Majestic 38647.

763 **III.**—VISCOUNTESS HEREFORD, Hampton Court, Leominster, for **Hampton Court Nelson**, born April 30, 1931; *s.* Pershore Patrician 50931, *d.* Hampton Court Pearl (vol. 60, p. 259) *by* Pioneer of Pitsford 42753.

Class 87.—*Hereford Bulls, born on or between September* 1 *and November* 30, 1931.[3]

767 **I., Champion[2] & Champion[4].**—PERCY E. BRADSTOCK, Free Town, Tarrington Herefordshire, for **Free Town Rear Admiral 54556**, born Sept. 26; *s.* Free Town Admiral 49233, *d.* Bluebell *by* Dinam Leader 43590.

766 **II.**—PERCY E. BRADSTOCK, for **Free Town Courageous 54555**, born Sept. 24; *s.* Eyton Taurus 49201, *d.* Rose Curly 4th *by* Pivot of Pitsford 45259.

Class 88.—*Hereford Bulls, born on or between December* 1, 1931, *and February* 29, 1932.

771 **I. & R.N. for Champion.[4]**—JOHN PARR, Burton, Ross, Herefordshire, for **Burton Maypole**, born Jan. 24, 1932; *s.* Clive Maypole 50325, *d.* Eaton Kate (vol. 60, p. 508) *by* Burton Cornerstone 44612.

769 **II.**—HENRY C. DENT, The Knapp, Pixley, Ledbury, for **Vern Jorrocks 55339**, born Dec. 14, 1931, bred by R. S. de Q. Quincey, The Vern, Bodenham; *s.* Free Town Baronet 50491, *d.* Orange *by* Bodenham Escourt 43848.

772 **III.**—MAJOR J. N. RITCHIE, Tern, Wellington, Shropshire, for **Tern Flash 55287**, born Dec. 1, 1931; *s.* Lydham Merrylute 50727, *d.* Tern Brilliant (vol. 59, p. 503) *by* Burton Showman 46873.

768 **R.N.**—HIS MAJESTY THE KING, The Royal Farms, Windsor, for **Windsor Bellman.**

Class 89.—*Hereford Bulls, born on or after March* 1, 1932.

775 **I.**—CAPT. R. T. HINCKES, Mansel Court, Hereford, for **Mansel Beaucarlo 54799**, born April 5, 1932; *s.* Mansel Beaustone 49478, *d.* Mansel Beauty 9th (Vol. 60, p. 382) *by* Orion of Pitsford 45197.

774 **II.**—WILLIAM EVERALL, Shrawardine Castle, Shrewsbury, for **Shraden Mintmoney**, born April 8, 1932; *s.* Pertonlute 50945, *d.* Shraden Sunflower 3rd (Vol. 62, p. 297) *by* Shraden Gambler 47584.

776 **III.**—THOMAS LAWSON WALKER, The Cedars, Broadwas-on-Teme, Worcester, for **Ankerdine Admiral**, born March 3, 1932; *s.* Resolute's Heir 51069, *d.* Ankerdine Pail (Vol. 60, p. 593) *by* Twyford Gambler 41742.

777 **R.N.**—H. WESTON & SONS, The Bounds, Much Marcle, Herefordshire, for **Bounds Weston.**

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[1] Champion Prize of £10 10*s.* given by the Hereford Herd Book Society for the best Senior Bull.

[2] Perpetual Silver Challenge Trophy given through the Hereford Herd Book Society for the best Bull.

[3] Prizes given by the Hereford Herd Book Society.

[4] Champion Prize of £10 10*s.* given by the Hereford Herd Book Society for the best Junior Bull.

Class 90.—*Hereford Cows or Heifers, in-milk, born on or before August* 31, 1930.

780 I.—L. J. Brereton, Lower Reule, Gnosall, Stafford, for **Primrose** (Vol. 62, p. 223), born Feb. 23, 1923, calved Feb. 12, 1933, bred by the Earl of Powis, Walcot, Lydbury North, Shropshire; *s.* Knight of Kars 39394, *d.* Plush *by* Chance 28985.

781 II.—J. C. Brookfield, Condover Grange, Shrewsbury, for **Condover Begonia 5th** (Vol. 61, p. 220), born Sept. 24, 1929, calved Sept. 27, 1932; *s.* Priory Resolute 41505, *d.* Condover Begonia *by* Orlando of Pitsford 42697.

782 III.—H. R. Griffiths, Little Tarrington, Herefordshire, for **Pershore Boundless** (Vol. 62, p. 592), born Sept. 12, 1926, calved Dec. 28, 1932, bred by E. Stevens, Chapel Farm, Elmley Castle, Pershore; *s.* Rose Showman 39935, *d.* Bountiful 7th *by* Patchwork 34099.

779 R.N.—Capt. E. H. Rouse Boughton, Downton Hall, Ludlow, for **Kiwi.**

Class 91.—*Hereford Heifers, born on or between September* 1, 1930, *and August* 31, 1931.

785 I. & Champion[1]—H. R. Griffiths, Little Tarrington, Herefordshire, for **Britannia** (Vol. 62, p. 328), born March 6, 1931; *s.* Tarrington Optimist 49837, *d.* Bluebell *by* Tarrington Marquis 45453.

786 II.—Charles Henry Morris, Weston Court, Pembridge, for **Weston Beauteous** (Vol. 62, p. 452), born Oct. 10, 1930; *s.* Hilarious 44969, *d.* Crossways Verbena 2nd *by* Bounteous 36107.

784 III.—Capt. E. H. Rouse Boughton, Downton Hall, Ludlow, for **Downton Hall Matron** (Vol. 62, p. 211), born Dec. 30, 1930; *s.* Samuel 39992, *d.* Kindle *by* Crossways Nancilute 44729.

783 R.N.—His Majesty The King, The Royal Farms, Windsor, for **Windsor Elsie.**

Class 92.—*Hereford Heifers, born on or between September* 1 *and November* 30, 1931.[2]

791 I.—Edward Webb & Sons (Stourbridge), Ltd., Astwood Farm, Stoke Works, Bromsgrove, for **Astwood Orange Blossom**, born Oct. 4; *s.* Free Town Counsellor 50495, *d.* Happy Sally (Vol. 59, p. 331) *by* Resolute 35537.

788 II.—J. C. Brookfield, Condover Grange, Shrewsbury, for **Condover Lively 2nd**, born Nov. 8; *s.* Eyton Worthy 51755, *d.* Lively 51st (Vol. 56, p. 187) *by* Walcot Trumpet 45518.

792 III.—Edward Webb & Sons (Stourbridge), Ltd., for **Astwood Oyster Girl**, born Sept. 11; *s.* Free Town Counsellor 50495, *d.* Gobion Oyster Girl (Vol. 57, p. 187) *by* Gobion Resolute 46010.

790 R.N.—Thomas Lawson Walker, The Cedars, Broadwas-on-Teme, Worcester, for **Ankerdine Cocoa.**

Class 93.—*Hereford Heifers, born on or after December* 1, 1931.

794 I. & R.N. for Champion.[1]—William Everall, Shrawardine Castle, Shrewsbury, for **Shraden Violet 2nd**, born Dec. 29, 1931; *s.* Pertonlute 50945, *d.* Shraden Comet (Vol. 61, p. 284) *by* Resolution 39896.

796 II.—Morgan T. Jones, Sugwas Farm, Hereford, for **Sugwas Corisande**, born March 18, 1932; *s.* Rocket 42889, *d.* Lynch Beauty 2nd (Vol. 57, p. 502) *by* Aldersend Envoy 44428.

795 III.—Viscountess Hereford, Hampton Court, Leominster, for **Hampton Court Glorious** (Vol. 63, p. 313), born Feb. 9, 1932; *s.* Pershore Patrician 50931, *d.* Dderw Georgina 6th *by* Leen Model 35195.

793 R.N.—His Majesty The King, The Royal Farms, Windsor, for **Windsor Betty.**

Devons.

Class 94.—*Devon Bulls, born in or before* 1931.

799 I. & Champion.[3]—James Lewis, Kensington Farm, Washfield, Tiverton, for **Netherexe Curly Boy 18259**, born Jan. 29, 1925, bred by Alford Bros., Netherexe, Stoke Canon, Exeter; *s.* Nerrols Airman 11968, *d.* Pickwell Curly Coat 36521 *by* Pickwell Jacob 3rd 10250.

800 II. & R.N. for Champion.[3]—Fred Stanbury, Ham Mill Farm, Launceston, for **Werrington Royalist 14681**, born Feb. 23, 1928, bred by A. M. Williams, Werrington Park, Launceston; *s.* Nerrols Best Man 12374, *d.* Cothelstone Ruth 32921 *by* All But 9935.

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[1] Champion Prize of £10 10s. given by the Hereford Herd Book Society for the best Cow or Heifer.

[2] Prizes given by the Hereford Herd Book Society.

[3] Champion Prize of £10 10s. given by the Devon Cattle Breeders' Society for the best Bull.

Class 95.—*Devon Bulls, born in* 1932.

803 I.—Fred Beadle, Stowey Farm, Timberscombe, Minehead, for **Stowey Earl 16254**, born Jan. 13; *s.* Carey Darkie Boy 2nd 13908, *d.* Upcott Duchess 9th 41934 *by* Pound Dazzle 11996.

807 II.—James Lewis, Kensington Farm, Washfield, Tiverton, for **Kittisford Noble**, born May 8, bred by A. J. Hill, Roadwater, Washford, Somerset; *s.* Croydon Count 14401, *d.* Lovely 54th 41434 *by* St. Audries Lordship 1339.

802 III.—G. C. Alexander, Manor House, Winterbourne Stoke, Salisbury, for **Stoke Colonel 16250**, born March 12; *s.* Stoke Glory 13760, *d.* Nerrols Ivy 4th 38797 *by* Norton Hero 12394.

806 R.N.—William King, Sandhill, Washford, Somerset, for **Sandhill Gay Lad.**
H.C.—801.

Class 96.—*Devon Cows or Heifers, in-milk, born in or before* 1930.

810 I. & Champion.[1]—W. J. Thomas, Prospect House, Landkey, Barnstaple, for **Prospect Snowdrop 43775**, born Feb. 15, 1930, calved June 14, 1933; *s.* Pound Romper 12413, *d.* Clampit Snowdrop 2nd 40037 *by* Highfield Gem 8919.

809 II. & R.N. for Champion.[1]—W. J. Thomas, for **Clampit Snowdrop 2nd 40037**, born March 12, 1927, calved March 7, 1933, bred by Cecil Brent, Clampit, Callington; *s.* Highfield Gem 8919, *d.* Hendra Snowdrop 4th 35208 *by* Nowers Bakerloo 11145.

808 III.—Cecil Brent, Clampit, Callington, Cornwall, for **Clampit Hygiene 10th 38902**, born April 30, 1926, calved March 10, 1933; *s.* Pound Romper 12413, *d.* Clampit Hygiene 7th 34700 *by* Highfield Gem 8919.

811 R.N.—Clifford Thorne, Rutland Villa, Maindee, Newport, Mon., for **Clampit Hygiene 12th.**

Class 97.—*Devon Heifers, born in* 1931.

815 I.—W. J. Thomas, Prospect House, Landkey, Barnstaple, for **Upcott Hilda 12th 44715**, born Feb. 9, bred by F. J. Yendell, Upcott, North Molton; *s.* Pound Hero 12824, *d.* Upcott Hilda 7th 39924 *by* Fiddington Viscount 10995.

812 II.—Fred Beadle, Stowey Farm, Timberscombe, Minehead, for **Stowey Primrose 43997**, born Feb. 14; *s.* Tockley Nonsuch 14206, *d.* Primrose 40386 *by* Pixford Woodman 11175.

814 III.—James Lewis, Kensington Farm, Washfield, Tiverton, for **Washfield Gay Lass 2nd 44421**, born June 26; *s.* Netherexe Curly Boy 13259, *d.* Washfield Gay Lass 38285 *by* Town Peerless 11681.

813 R.N.—Nathaniel Heard & Sons, Home Farm, Werrington, Launceston, for **Milltown Pride 3rd.**

Class 98.—*Devon Heifers, born in* 1932.

816 I.—Fred Beadle, Stowey Farm, Timberscombe, Minehead, for **Stowey Jane 44887**, born Jan. 12; *s.* Carey Darkie Boy 2nd 13908, *d.* Upcott Jane 39926 *by* Fiddington Viscount 10995.

819 II.—R. Gynn & Son, Treslay, Boscastle, Cornwall, for **Treslay Frolic 45162**, born Feb. 8; *s.* Ham Mill Favourite 4th 14883, *d.* Treslay Sally 1st 42293 *by* Netherexe Good Sort 13693.

817 III.—Cecil Brent, Clampit, Callington, Cornwall, for **Clampit Dainty 13th 44917**, born April 1; *s.* Clampit Goldminer 16206, *d.* Clampit Dainty 10th 41040 *by* Pound Romper 12413.

820 R.N.—D. J. Thomas, Prospect House, Landkey, Barnstaple, for **Brightly Rose.**

Sussex.

Class 99.—*Sussex Bulls, born in or before* 1931.

822 I., Champion,[2] Champion[3] & R.N. for Champion.[4]—Edward Hurtley, Crowborough Warren, Sussex, for **Crowborough Warren Marksman 6th 7200**, born March 14, 1929; *s.* Bolebroke Marksman 14th 6827, *d.* Oakover Daisy 25th 22272 *by* Oakover Chevalier 6th 5610.

825 II., R.N. for Champion,[2] & R.N. for Champion.[3]—Col. J. R. Warren, O.B.E., M.C., The Hyde, Handcross, Haywards Heath, for **Bolebroke Rover 1st 7411**, born April 7, 1930, bred by P. R. Mann, Hartfield, Sussex; *s.* Crowborough Warren Rover 8th 6998, *d.* Lock Darkey 28th 18388 *by* Birling Geoffrey 2nd 4252.

824 III.—L. O. Johnson, Peppers, Ashurst, Steyning, Sussex, for **King's Barn Lad 7524**, born Jan. 28, 1931; *s.* Petworth Toreador 16th 6802, *d.* Oakover Stonesdown 30th 22986 *by* Oakover Lad 18th 5819.

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[1] Champion Prize of £10 10*s.* given by the Devon Cattle Breeders' Society for the best Cow or Heifer.

[2] Champion Silver Medal given by the Sussex Herd Book Society for the best Bull.

[3] Perpetual Silver Challenge Trophy given through the Sussex Herd Book Society for the best Bull.

[4] Perpetual Silver Challenge Cup given by the Sussex Cattle Breeders' Society of South Africa for the best Sussex.

Class 100.—*Sussex Bulls, born in* 1932.

827 **I.**—Edward Hurtley, Crowborough Warren, Sussex, for **Crowborough Warren Honest 12th** 7666, born Feb. 29; *s.* Dillions Honest 7050, *d.* Lock Briar 2nd 21914 *by* Jacobite 5116.

829 **II.**—Col. J. R. Warren, O.B.E., M.C., The Hyde, Handcross, Haywards Heath, for **Handcross Harlequin 3rd** 7741, born Jan. 5; *s.* Handcross Harlequin 7303, *d.* Wickham Court Beauty 113th 25273 *by* Ripton Rover 4554.

828 **III.**—Edward Hurtley, for **Crowborough Warren Marksman 21st** 7668, born Jan. 16; *s.* Crowborough Warren Marksman 6th 7200, *d.* Crowborough Warren Bonette 22756 *by* Birling Delightful 4740.

Class 101.—*Sussex Cows or Heifers, in-milk, born in or before* 1930.

831 **I., Champion,[1] & Champion.[2]**—Col. J. R. Warren, O.B.E., M.C., The Hyde, Handcross, Haywards Heath, for **Lock Knelle 2nd** 23244, born March 16, 1926, calved April 30, 1933, bred by E. Ezra, Lock, Partridge Green; *s.* Bolebroke Harlequin 3rd 6247, *d.* Marlands Lady Knelle 20113 *by* Jacobite 5116.

830 **II.**—Edward Hurtley, Crowborough Warren, Sussex, for **Crowborough Warren Princess 1st** 25692, born Jan. 24, 1930, calved Jan. 10, 1933; *s.* Otham Pilgrim 6521, *d.* Tilsden Princess 24th 24332 *by* Prince Bill of Lyne 6322.

Class 102.—*Sussex Heifers, born in* 1931.

832 **I. & R.N. for Champion.[2]**—Brig.-Gen. G. Holdsworth, C.B., C.M.G., Glynde Place, Glynde, Sussex, for **Caburn Daisy 7th** 26138, born Jan. 30; *s.* Caburn Diploma 6370, *d.* Caburn Daisy 1st 22069 *by* Quedley Duke 3rd 5083.

835 **II.**—Col. J. R. Warren, O.B.E., M.C., The Hyde, Handcross, Haywards Heath, for **Handcross Gentle 1st** 26371, born Feb. 11; *s.* Handcross Harlequin 7303, *d.* Goldstone Gentle 2nd 20744 *by* Goldstone Prince 4411.

833 **III.**—Edward Hurtley, Crowborough Warren, Sussex, for **Crowborough Warren Galatea 4th** 26168, born Jan 28; *s.* Dillions Honest 7050, *d.* Crowborough Warren Galatea 1st 24064 *by* Oakover Lad 18th 5819.

834 **R.N.**—L. O. Johnson, Peppers, Ashurst, Steyning, for **King's Barn Dusky 2nd.**

Class 103.—*Sussex Heifers, born in* 1932.

836 **I.**—Brig.-Gen. G. Holdsworth, C.B., C.M.G., Glynde Place, Glynde, Sussex, for **Caburn Beauty 17th** 26570, born Jan. 10; *s.* Kennington Marksman 7208, *d.* Caburn Beauty 10th 25212 *by* Caburn Diploma 6370.

838 **II.**—Col. J. R. Warren, O.B.E., M.C., The Hyde, Handcross, Haywards Heath, for **Handcross Heedless 1st** 26761, born Jan. 21; *s.* Handcross Count 7445, *d.* Lock Heedless 14th 23917 *by* Bolebroke Harlequin 3rd 6247.

837 **III.**—Edward Hurtley, Crowborough Warren, Sussex, for **Crowborough Warren Crystal 3rd** 26594, born Jan. 10; *s.* Dillions Honest 7050, *d.* Lock Crystal 2nd 21915 *by* Jacobite 5116.

Welsh.

Class 104.—*Welsh Bulls, born on or before November* 30, 1931.

840 **I. & Champion.[3]**—Lord Penrhyn, Penrhyn Castle, Bangor, for **Egryn Addewid** 3727, born Aug. 25, 1927; *s.* Escuan Cawr 1640, *d.* Escuan Blacen 2026 *by* Escuan Meurig 437.

839 **II. & R.N. for Champion.[3]**—T. & R. Jones, Lleuar Fawr, Penygroes, Caernarvonshire, for **Caradoc** 4059, born Nov. 30, 1929, bred by W. Evans, Dollychwyn, Bala; *s.* Penrhos Caradog 3805, *d.* Eliza 5728 *by* Snowdon General 1774.

840, 845, 855 **Gold Medal.[4]**—Lord Penrhyn, for **Egryn Addewid, Kitty 10th of Penrhyn and Hester 50th of Penrhyn.**

Class 105.—*Welsh Bulls, born on or between December* 1, 1931, *and November* 30, 1932.

841 **I.**—Lord Penrhyn, Penrhyn Castle, Bangor, for **Penrhyn Hercules**, born Dec. 17, 1931; *s.* Egryn Addewid 3727, *d.* Hester 21 of Penrhyn 7837 *by* Madryn Laddie 1403.

843 **II.**—Mrs. Williams-Owen, Treveilyr, Bodorgan, Anglesey, for **Treveilyr Kaffir**, born Feb. 5, 1932; *s.* Egryn Banerwr 3900, *d.* Treveilyr Flame 10009 *by* Penmynydd Iolo 2824.

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[1] Perpetual Silver Challenge Cup given by the Sussex Cattle Breeders' Society of South Africa for the best Sussex.

[2] Champion Silver Medal given by the Sussex Herd Book Society for the best Cow or Heifer.

[3] Champion Silver Medal given by the Welsh Black Cattle Society for the best Bull.

[4] Gold Medal given by the Welsh Black Cattle Society for the best group of one Bull and two Cows or Heifers.

842 **III.**—The Hon. Lady Shelley Rolls, The Hendre, Monmouth, for **Glandyfi Banquet,** born Aug. 29, 1932, bred by R. A. C. Pugh, Glandyfi, Cardiganshire; *s.* Penrhyn Bank 3984, *d.* Glandyfi Mimi 2nd 9369.

843, 848, 854 **R.N. for Gold Medal.**[1]—Mrs. Williams-Owen, for **Treveilyr Kaffir, Treveilyr Hera** and **Treveilyr Joan.**

Class 106.—*Welsh Cows or Heifers, in-milk, born on or before November* 30, 1930.

845 **I. & Champion.**[2]—Lord Penrhyn, Penrhyn Castle, Bangor, for **Kitty 10th of Penrhyn** 8589, born Feb. 20, 1925, calved Sept. 7, 1932; *s.* Harold of Penrhyn 1984, *d.* Kitty 7th of Penrhyn 7005 *by* Gamecock of Penrhyn 1650.

846 **II. & R.N. for Champion.**[2]—The Hon. Lady Shelley Rolls, The Hendre, Monmouth, for **Glyn Redshank** 9660, born Dec. 9, 1926, calved Feb. 25, 1933, bred by Lord Harlech, Glyn Home Farm, Talsarnau, Merioneth; *s.* Plas Samson 2925, *d.* Glyn Kittiwake 4116 *by* Madryn Joffre 1147.

848 **III.**—Mrs. Williams-Owen, Treveilyr, Bodorgan, Anglesey, for **Treveilyr Hera** 10945, born Jan. 18, 1929, calved March 11, 1933; *s.* Treveilyr Falcon 3656, *d.* Treveilyr Bragwaine 8043 *by* Ty Croes Volunteer 2129.

849 **R.N.**—Mrs. Williams-Owen, for **Treveilyr Holly.**

Class 107.—*Welsh Heifers, born on or between December* 1, 1930, *and November* 30, 1931.

854 **I.**—Mrs. Williams-Owen, Treveilyr, Bodorgan, Anglesey, for **Treveilyr Joan** 11818, born Feb. 4, 1931; *s.* Egryn Banerwr 3900, *d.* Treveilyr Eira 9474 *by* Penmynydd Iolo 2324.

850 **II.**—Lord Penrhyn, Penrhyn Castle, Bangor, for **Calenig 14th of Penrhyn** 11646, born Dec. 26, 1930; *s.* Nicholas 2888, *d.* Calenig 9th of Penrhyn 9805 *by* Ronald of Nantclwyd 2359.

853 **III.**—The Hon. Lady Shelley Rolls, The Hendre, Monmouth, for **Hendre Doli** 11721, born Dec. 25, 1930; *s.* Graemes Hector 3747, *d.* Dollgaer 7148 *by* Insurance of Penrhyn 1392.

851 **R.N.**—The Hon. Lady Shelley Rolls, for **Brenda.**

C.—852.

Class 108.—*Welsh Heifers, born on or between December* 1, 1931, *and November* 30, 1932.

855 **I.**—Lord Penrhyn, Penrhyn Castle, Bangor, for **Hester 50th of Penrhyn,** born Jan. 28, 1932; *s.* Egryn Addewid 3727, *d.* Hester 25th of Penrhyn 8592 *by* Bruiser of Penrhyn 2187.

856 **II.**—Mrs. Williams-Owen, Treveilyr, Bodorgan, Anglesey, for **Treveilyr Kittiwake,** born Jan. 3, 1932; *s.* Egryn Banerwr 3900, *d.* Treveilyr Edna 10005 *by* Penmynydd Iolo 2324.

Longhorns.

Class 109.—*Longhorn Bulls, born in or before* 1931.

860 **I. & Champion.**[3]—R. S. Walters, Norfolk Lodge, Sutton Coldfield, for **Sutton Victor** 948, red, brindle and white, born March 27, 1929; *s.* Arden Final 891, *d.* Lady Violet of Kent *by* Admiral 632.

858 **II.**—W. E. Swinnerton, Crickley Barrow House, Northleach, Glos., for **Crickley Nobleman** 954, red, brindle and white, born April 1, 1930; *s.* Waddon Duke 950, *d.* Chestnut of Chippinghurst *by* Park Royal 777.

857 **III.**—F. J. Mayo, Friar Waddon, Upwey, Weymouth, for **Sutton Ruler** 947, red, brindle and white, born Aug. 6, 1929, bred by R. S. Walters, Norfolk Lodge, Sutton Coldfield; *s.* Arden Final 891, *d.* Royal Ruth of Kent *by* Prince Diadem of Kent 778.

859 **R.N.**—J. W. Swinnerton-Weston, Over Whitacre House, Birmingham, for **Whitacre Beau 2nd.**

859, 868, 869 **Special I.**[4]—J. W. Swinnerton-Weston, for **Whitacre Beau 2nd, Whitacre Lark 3rd** and **Whitacre Sunrise.**

860, 875, 876 **Special II.**[4]—R. S. Walters, Norfolk Lodge, Sutton Coldfield, for **Sutton Victor, Sutton Dido 2nd** and **Sutton Vivi.**

858, 865, 866 **R.N. for Specials.**[4]—W. E. Swinnerton, for **Crickley Nobleman, Carnation of Chippinghurst** and **Crickley Violet.**

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[1] Gold Medal given by the Welsh Black Cattle Society for the best group of one Bull and two Cows or Heifers.

[2] Champion Silver Medal given by the Welsh Black Cattle Society for the best Cow or Heifer.

[3] Perpetual Silver Challenge Cup given by the Longhorn Cattle Society for the best Senior Longhorn.

[4] Special Prizes of £10 (First Prize) and £5 (Second Prize) given by the Longhorn Cattle Society for the best groups of one Bull and two Cows or Heifers.

Class 110.—*Longhorn Bulls, born in* 1932.

862 I.—R. S. Walters, Norfolk Lodge, Sutton Coldfield, for **Sutton Patrick**, red, brindle and white, born March 7; *s.* Arden Final 891, *d.* Westmeath Dorothy (Vol. 17, p. 18).
863 II.—R. S. Walters, for **Sutton Spec**, red, brindle and white, born April 2; *s.* Sutton Victor 948, *d.* Friar Special (Vol. 16, p. 10) *by* Friar Pop 902.
861 III.—W. E. Swinnerton, Crickley Barrow House, Northleach, Glos., for **Crickley Duke**, red, brindle and white, born June 27; *s.* Crickley Nobleman 954, *d.* Carnation of Chippinghurst (Vol. 13, p. 23) *by* Prince Diadem of Kent 778.

Class 111.—*Longhorn Cows or Heifers, in-milk, born in or before* 1930.

868 **I. & R.N. for Champion.**[1]—J. W. Swinnerton-Weston, Over Whitacre House, Birmingham, for **Whitacre Lark 3rd** (Vol. 16, p. 14), red and white, born June 11, 1928, calved May 24, 1933; *s.* Arden Final 891, *d.* Larkspur of Chippinghurst *by* Chippinghurst Greatheart 812.
866 II.—W. E. Swinnerton, Crickley Barrow House, Northleach, Glos., for **Crickley Violet** (Vol. 16, p. 13), red, brindle and white, born June 7, 1928, calved June 18, 1933; *s.* Arden Dairyman 890, *d.* Violet of Chippinghurst *by* Chippinghurst Chief 861.
865 III.—W. E. Swinnerton, for **Carnation of Chippinghurst** (Vol. 13, p. 23), red, brindle and white, born May 31, 1922, calved May 19, 1933, bred by H. B. Parsons, Eastwell, Ashford, Kent; *s.* Prince Diadem of Kent 778, *d.* Lady Violet of Kent *by* Admiral 632.
869 R.N.—J. W. Swinnerton-Weston, for **Whitacre Sunrise.**
H.C.—867.

Class 112.—*Longhorn Heifers, born in* 1931 *or* 1932.

871 **I. & Champion.**[2]—R. R. Hollick, Stivichall Grange, Coventry, for **Finham Angelina 3rd** (Vol. 17, p. 8), brindle and white, born Jan. 25, 1931; *s.* Sutton Rufus 930, *d.* Angelina of Bentley *by* Rousham Friar 906.
876 **II. & R.N. for Champion.**[2]—R. S. Walters, Norfolk Lodge, Sutton Coldfield, for **Sutton Vivi** (Vol. 17, p. 14), red, brindle and white, born March 5, 1931; *s.* Sutton Victor 948, *d.* Lady Violet of Kent *by* Admiral 632.
872 III.—F. J. Mayo, Friar Waddon, Upwey, Weymouth, for **Friar Dear** (Vol. 17, p. 9), red, brindle and white, born May 24, 1931; *s.* Friar Bakewell 923, *d.* Friar Dot *by* Bakewell 856.
874 R.N.—W. E. Swinnerton, Crickley Barrow House, Northleach, Glos., for **Stivichall Ruby 8th.**
H.C.—873, 875.

Aberdeen-Angus.

Class 113.—*Aberdeen-Angus Bulls, born on or before November* 30, 1930.

879 **I., R.N. for Champion,[3] Trophy,[4] & Gold Medal.**[5]—Mrs. D. A. J. Cunningham-Jardine, Applegirth, Lockerbie, for **Jujuy 74424**, born April 17, 1930, bred by Capt. W. Smith Grant, Minmore, Glenlivet; *s.* Gymnast 67676, *d.* Jocelyn 81225 *by* Glenavon of Ballindalloch 57188.
887 **II., R.N. for Trophy,[4] & R.N. for Gold Medal.**[5]—Robert W. Walker, Portlethen, Aberdeen, for **Bugbane 78006**, born March 25, 1930; *s.* Pundit of Moyness 49137, *d.* Brunhilda 26th 78072 *by* Jitomir 43907.
877 III.—Viscount Allendale, Bywell Hall, Stocksfield-on-Tyne, for **Victor of Bywell 75727**, born April 28, 1930; *s.* Elurio of Nisbethill 67008, *d.* Viva of Apethorpe 78088 *by* Black Jester 54062.
883 R.N.—Sir Prince Prince-Smith, Bart., Southburn House, Driffield, for **Barbary of Southburn.**

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[1] Perpetual Silver Challenge Cup given by the Longhorn Cattle Society for the best Senior Longhorn.

[2] Perpetual Silver Challenge Cup given by the Longhorn Cattle Society for the best Junior Longhorn.

[3] Champion Gold Medal given by the Aberdeen-Angus Cattle Society for the best Aberdeen-Angus.

[4] Perpetual Silver Challenge Trophy given through the Aberdeen-Angus Cattle Society for the best Bull.

[5] Gold Medal given by the English Aberdeen-Angus Cattle Association for the best animal of the opposite sex to that of the animal awarded the Champion Gold Medal of the Aberdeen-Angus Cattle Society.

Class 114.—*Aberdeen-Angus Bulls, born on or between December* 1, 1930, *and November* 30, 1931.

890 **I., R.N. for Silver Medal**[1]—Col. J. F. N. Baxendale, C.B., Froxfield Green, Petersfield, for **Erman of Amport** 77197, born Feb. 7, 1931, bred by Col. C. W. Sofer Whitburn, Amport, Andover; *s.* Proud Baladan of The Burn 62756, *d.* Edna of Amport 82723 *by* Euryalus of Ballindalloch 48123.

895 **II.**—W. L. Horbury, Ettington Park, Stratford-on-Avon, for **Jiltaur of Achvochkie** 77894, born Dec. 5, 1930, bred by David Dean, Achvochkie; *s.* Bustard of Kinermony 66555, *d.* Jillet of Achvochkie 76155 *by* Gigns of Ballindalloch 41656.

899 **III.**—Francis W. Walker, Leys Castle, Inverness-shire, for **Primus of Lethen** 78679, born Dec. 19, 1930, bred by Messrs. Brodie, Lethen, Nairn; *s.* Election of Bleaton 70218, *d.* Primula of Lethen 86206 *by* Erdon of Bleaton 54596.

889 **R.N.**—Viscount Allendale, Bywell Hall, Stocksfield-on-Tyne, for **Pelorus of Bywell.**

Class 115.—*Aberdeen-Angus Bulls, born on or between December* 1, 1931, *and November* 30, 1932.

909 **I.**—T. & M. Templeton, Sandyknowe, Kelso, for **Jason Eric** 81284, born March 24, 1932, bred by J. E. Kerr, Harviestoun, Dollar; *s.* Jubal Eric 74413, *d.* Janette Erica 87331 *by* Enthraller of Lethen 54562.

902 **II., & Silver Medal.**[1]—Capt. F. B. Atkinson, Home Farm, Gallowhill, Morpeth, for **Gallowhill Beauty** 80981, born Dec. 20, 1931; *s.* Master Bingham of Doonholm 68142, *d.* Bright Ray 85972 *by* Erector of Candacraig 54599.

906 **III.**—Col. Norman Kennedy, D.S.O., Doonholm, Ayr, for **Koko of Dunira** 81477, born Feb. 17, 1932, bred by W. Gilchrist Macbeth, Dunira, Comrie; *s.* Erman of Dunira 70474, *d.* Kobe 69602 *by* Master Bummer 46346.

903 **R.N.**—E. Keith Brooks, Thatcham, Berks., for **Elenorist of Ballintomb.**

Class 116.—*Aberdeen-Angus Cows or Heifers, in-milk, born on or before November* 30, 1930.

914 **I. & Champion.**[2]—Col. Norman Kennedy, D.S.O., Doonholm, Ayr, for **Elinka of Doonholm** 87315, born Jan. 28, 1928, calved Feb. 20, 1933; *s.* Eryn of Doonholm 59161, *d.* Elmina of Doonholm 76615 *by* Prince Benson of Ballindalloch 51308.

911 **II.**—Capt. F. B. Atkinson, Home Farm, Gallowhill, Morpeth, for **Bond Maid of Banks** 89279, born Dec. 22, 1928, calved April 2, 1933, bred by James Beddie, Banks, Strichen, Scotland; *s.* Grierson of Ballindalloch 54969, *d.* Beatrix of Pitfour 78485 *by* Evolever of Ballindalloch 50518.

917 **III.**—Robert W. Walker, Portlethen, Aberdeen, for **Euthanasia 9th** 88761, born Dec. 13, 1927, calved April 14, 1933; *s.* Pundit of Moyness 49137, *d.* Euthanasia 8th 65986 *by* Erris of Bleaton 39494.

919 **R.N.**—The Marquess of Zetland, G.C.S.I., G.C.I.E., Aske, Richmond, Yorks., for **Bulgaric Maid of Bleaton.**

Class 117.—*Aberdeen-Angus Heifers, born on or between December* 1, 1930, *and November* 30, 1931.

927 **I.**—Robert W. Walker, Portlethen, Aberdeen, for **Edia of Portlethen** 98431, born March 4, 1931; *s.* Election of Bleaton 70218, *d.* Edia 7th of Lethen 89482 *by* Eveljor of Ballindalloch 59275.

924 **II.**—Col. Norman Kennedy, D.S.O., Doonholm, Ayr, for **Muscatel of Doonholm** 97050, born March 14, 1931; *s.* Prince Benson of Doonholm 71867, *d.* Marsala 62717 *by* Planet of Duthil 35008.

922 **III.**—D. S. Gough, Old Hall, Pakenham, Bury St. Edmunds, for **Black Dala 2nd of Ballintomb** 95589, born Feb. 18, 1931, bred by D. M. Allan, Ballintomb, Grantown-on-Spey; *s.* Wilful Watch 65950, *d.* Blackbird of Delbuiach 81165 *by* Rocket of Gallovie 58018.

926 **R.N.**—Sir Prince Prince-Smith, Bart., Southburn House, Driffield, for **Proud Aileen of Southburn.**

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[1] Silver Medal given by the English Aberdeen-Angus Cattle Association for the best animal bred in England or Wales.

[2] Champion Gold Medal given by the Aberdeen-Angus Cattle Society for the best Aberdeen-Angus.

Class 118.—*Aberdeen-Angus Heifers, born on or between December* 1, 1931, *and November* 30, 1932.

928 **I.**—Viscount Allendale, Bywell Hall, Stocksfield-on-Tyne, for **Evaboxa 2nd 100797**, born Dec. 14, 1931, bred by J. McG. Petrie, Asleid, New Deer; *s.* Ettacote 73832, *d.* Evaboxa 72547 *by* Boxer of Ballindalloch 47409.

933 **II.**—D. S. Gough, Old Hall, Pakenham, Bury St. Edmunds, for **Mungos Grisildis 10146**, born Dec. 19, 1931, bred by J. P. Ross-Taylor, Mungoswalls, Duns; *s.* Elf of Dunira 73508, *d.* Graceful of Mungoswalls 77283 *by* Evolater of Ballindalloch 50517.

935 **III.**—Col. Norman Kennedy, D.S.O., Doonholm, Ayr, for **Bettine of Doonholm 100117**, born Feb. 19, 1932; *s.* Mohawk of Doonholm 74707, *d.* Bettina of Doonholm 78885 *by* Prince Benson of Ballindalloch 51308.

938 **IV.**—Lady Robinson, Kirklington Hall, Newark, for **Bullace of Kirklington 100987**, born Dec. 22, 1931; *s.* Kismet of Lochbank 57420, *d.* Bullita of Pitskelly 91308 *by* Hayston Insiza 61928.

929 **R.N.**—Col. J. F. N. Baxendale, C.B., Froxfield Green, Petersfield, for **Era of Froxfield.**

Cup.[1]—Col. Norman Kennedy.

R.N. for Cup.[1]—Robert W. Walker.

Belted Galloways.

Class 119.—*Belted Galloway Bulls, born on or before November* 30, 1932.

941 **I.**—Gen. Sir Ian Hamilton, 1, Hyde Park Gardens, London, W., for **Knockbrex Heron 955 B.**, born Dec. 30, 1929, bred by J. D. Brown, Knockbrex, Kirkcudbright; *s.* Boreland Clarion 441 B., *d.* Knockbrex Lady Belinda 175 B. *by* Knockbrex Viking 50 B.

942 **II.**—The Nalc Company, Ltd., Gartmore, Stirling, for **Gartmore Robin, 707 B.**, born April 17, 1927, bred by Sir August Cayzer, Bart., Gartmore; *s.* Mark Hector 56 B., *d.* Nan of Auchengassel 27570 *by* Tramp of Auchengassel 13488.

Class 120.—*Belted Galloway Cows or Heifers, in-milk, born on or before November* 30, 1930.

945 **I.**—The Nalc Company, Ltd., Gartmore, Stirling, for **Gartmore Helen 1st 1322 B.**, born April 7, 1927, calved Dec. 29, 1932, bred by Sir August Cayzer, Bart., Gartmore; *s.* Mark Hector 56 B., *d.* Gartmore Helen *by* Tramp of Auchengassel 13488.

944 **II.**—Gen. Sir Ian Hamilton, 1, Hyde Park Gardens, London, W., for **Shenley Barbara 1682 B.**, born Dec. 25, 1927, calved Feb. 14, 1933, bred by R. C. Irving, Ridge Hill, Barnet; *s.* Mindork Lucky Boy 655 B., *d.* Knockbrex Bertha 610 B. *by* Knockbrex Prince Imperial 109 B (D).

943 **III.**—Gen. Sir Ian Hamilton, for **Gartmore Lily 2nd 1326 B.**, born Feb. 11, 1927, calved Feb. 19, 1933, bred by Sir August Cayzer, Bart., Gartmore, Stirling; *s.* Mark Freeman 507 B., *d.* Gartmore Lily 1st 586 B. *by* Mark Hector 56 B.

Class 121.—*Belted Galloway Heifers, born on or between December* 1, 1930, *and November* 30, 1931.

948 **I. & R.N. for Champion**[2]—The Nalc Company Ltd., Gartmore, Stirling, for **Gartmore Nell 1st 2258 B.**, born Dec. 23, 1930, bred by Sir August Cayzer, Bart., Gartmore; *s.* Gartmore Nigel 839 B., *d.* Gartmore Duchess 7th 1614 B. *by* Mark Hector 56 B.

947 **II.**—Gen. Sir Ian Hamilton, 1, Hyde Park Gardens, London, W., for **Lullenden Poppy 3124 B.**, born Dec. 12, 1930; *s.* Allington Concrete 467 B., *d.* Lullenden June 1388 B. *by* Lullenden Douglas 449 B.

Class 122.—*Belted Galloway Heifers, born on or between December* 1, 1931, *and November* 30, 1932.[3]

952 **I. & Champion.**[2]—Robert Chrystal Irving, Shenley Lodge, Ridge Hill, Barnet, for **Shenley Freckles 3132 B. (D.)**, born Feb. 2, 1932; *s.* Knockbrex Prince Imperial 109 B. (D.), *d. by* Mindork Admiral 58 B.

953 **II.**—The Nalc Company, Ltd., Gartmore, Stirling, for **Gartmore Edith 1st 3058 B.**, born April 1, 1932, bred by Sir August Cayzer, Bart., Gartmore; *s.* Knockbrex Eagle 685 B., *d.* Gartmore Lucy *by* Tramp of Auchengassel 13488.

951 **III.**—Robert Chrystal Irving, for **Shenley Fleeting Memory 3130 B. (D.)**, born Jan. 16, 1932; *s.* Knockbrex Prince Imperial 109 B. (D.), *d. by* Knockbrex Pollox 49 B.

949 **R.N.**—Gen. Sir Ian Hamilton, 1 Hyde Park Gardens, London, W., for **Lullenden Bess.**

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[1] The "Mungoswalls" Silver Challenge Cup given through the English Aberdeen-Angus Cattle Association for the most points awarded in a combination of entries.

[2] The "Knockbrex" Perpetual Silver Challenge Cup given through the Dun and Belted Galloway Cattle Breeders' Association for the best Belted Galloway.

[3] Prizes given by the Dun and Belted Galloway Cattle Breeders' Association.

Galloways.

Class 123.—*Galloway Bulls, born on or before November* 30, 1932.

955 I.—James Keith Anderson, Kirtleton, Waterbeck, Dumfriesshire, for **Culmark Conjuror** 18592, born March 7, 1932, bred by Hugh Fraser, Culmark, Castle Douglas; *s.* War Bond 16265, *d.* Lady Rose 3rd of Scroggie Hall 31118 *by* Barmark Conjuror 14741.

960 II.—D. & J. Little, Whitehill, Corrie, Lockerbie, for **Complete of Whitehill** 18711, born Feb. 17, 1932; *s.* Vindicator 3rd of Whitehill 17881, *d.* Barmark Lady Nancy 4th 32874 *by* War Bond 3rd 16265.

959 III.—Francis N. M. Gourlay, Kirkland, Tynron, Dumfriesshire, for **Emilius of Kirkland** 18631, born Feb. 4, 1932; *s.* Leo of Castlemilk 15883, *d.* Fiona 2nd of Craigneston 26985 *by* Raleigh of Killearn 11988.

Class 124.—*Galloway Cows or Heifers, in-milk, born on or before November* 30, 1930.

962 I. & R.N. for Champion.[1]—Sir John W. Buchanan-Jardine of Castlemilk, Bart., Norwood, Lockerbie, for **Lady Constance of Castlemilk** 30925, born Jan. 29, 1926, calved April 22, 1933, bred by Sir R. W. Buchanan-Jardine, Bart., Castlemilk; *s.* Aviator 2nd of Castlemilk 15612, *d.* Lady Constance of Castlemilk 29142 *by* Challenger of Castlemilk 14499.

965 II.—Robert Jardine Paterson, Balgray, Lockerbie, for **Melba 3rd of Balgray** 33746, born Feb. 16, 1930, calved Jan. 22, 1933; *s.* Tarbreoch Knight 15526, *d.* Melba of Balgray 30938 *by* Marksman of Thorniehill 14445.

961 III.—Sir John W. Buchanan-Jardine of Castlemilk, Bart., for **Lady Brownie of Castlemilk** 30819, born Feb. 18, 1925, calved March 14, 1933, bred by Sir R. W. Buchanan-Jardine, Bart., Castlemilk; *s.* Mormon of Dalwyne 12617, *d.* Brownie 3rd of Castlemilk 28129 *by* Ideal of Thorniehill 12342.

Class 125.—*Galloway Heifers, born on or between December* 1, 1930, *and November* 30, 1931.

968 I. & Champion.[1]—Francis N. M. Gourlay, Kirkland, Tynron, Dumfriesshire, for **Favourite 5th of Kirkland** 34404, born April 7, 1931; *s.* Enigma of Dormont 17279, *d.* Fenella 5th of Craigneston 27569 *by* Raleigh of Killearn 11988.

966 II.—Sir John W. Buchanan-Jardine of Castlemilk, Bart., Norwood, Lockerbie, for **Elite 7th of Castlemilk** 24472, born Feb. 4, 1931; *s.* Aviator 2nd of Castlemilk 15612, *d.* Elite of Castlemilk 26496 *by* Jovial of Blackcombe 11716.

967 III.—Charles S. Forrester, Skitby, Kirklinton, Carlisle, for **Beauty of Skitby** 34313, born Dec. 22, 1930; *s.* Dreadnought 5th 15708, *d.* Brinhilda 13th of Skitby 32094 *by* Barmark Merlin 2nd 15554.

Class 126.—*Galloway Heifers, born on or between December* 1, 1931, *and November* 30, 1932.[2]

974 I.—Charles S. Forrester, Skitby, Kirklinton, Carlisle, for **Lucy 7th of Skitby** 35056, born March 18, 1932; *s.* Dreadnought 5th 15708, *d.* Lucy of Skitby 29047 *by* Kennedy of Killearn 14106.

977 II.—D. & J. Little, Whitehill, Corrie, Lockerbie, for **Culmark Queen 4th** 35080, born April 9, 1932, bred by Hugh Fraser, Culmark, Knowhead, Castle Douglas; *s.* War Bond 3rd 16265, *d.* Barmark Scottish Queen 29684 *by* Barlae Commodore 15149.

979 III.—Robert Jardine Paterson, Balgray, Lockerbie, for **Chrissie 4th of Balgray** 35206, born March 20, 1932; *s.* Tarbreoch Knight 15526, *d.* Chrissie of Balgray 30937 *by* Tasty Mark 14067.

978 R.N.—D. & J. Little, for **Nettie 25th of Whitehall.**

Dairy Shorthorns.

Class 127.—*Dairy Shorthorn Bulls, born in or before* 1930.

981 I. & Champion.[3]—Sir Mark Collet, Bart., St. Clere, Kemsing, Sevenoaks, for **Greattew Waterloo** 223446, dark roan, born Dec. 15, 1927, bred by Ralph Tustian, The Leys, Great Tew, Oxford; *s.* Sorbrook Clarence 194218, *d.* 72709 Borohill Waterloo Rosebud 2nd *by* Borohill Pantry Boy 187553.

982 II.—D. Constantine & Son, Ltd., Breightmet Fold Farm, Ainsworth, Bolton, for **Pilling Foundation Stone** 246337, dark roan, born June 8, 1930, bred by W. Pearson, New Hall Farm, Pilling, Garstang; *s.* Pilling Masterpiece 282565, *d.* 40951 Sylvan Maid 3rd *by* Fylde Baritone 10th 155896.

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[1] The "Jubilee" Perpetual Silver Challenge Cup given by the Galloway Cattle Society for the best Galloway.

[2] Prizes given by the Galloway Cattle Society.

[3] Champion Prize of £10 given by the Dairy Shorthorn Association for the best Bull.

988 III.—W. J. Whitehand, Old Hall, South Walsham, Norwich, for **May Prince** 231962, roan, born May 28, 1928, bred by J. K. & R. M. Fenwick, Lesson Hall, Wigton; *s.* Prince Supreme 210534, *d.* 73302 Madeline 11th *by* Fellside Dairyman 180763.

987 R.N.—Robert N. Tory, Anderson, Blandford, for **Anderson Imperial Minstrel 2nd.**

H.C.—985.

981, 1060, 1120 **R.N. for Cup.**[1]—Sir Mark Collet, Bart., for **Greattew Waterloo, St. Clere Miss 2nd** and **St. Clere Daffodil 13th.**

Class 128.—*Dairy Shorthorn Bulls, born in* 1931.

996 I.—Hobbs & Davis, Kelmscott, Lechlade, for **Iford Lord Lee 8th** 251546, roan, born March 18, bred by J. & H. Robinson, Iford, Lewes; *s.* Kingsthorpe Count Rubio 4th 208775, *d.* 78933 Iford Nellie Lee 3rd *by* Thornby Royal Foggathorpe 167531.

989 II.—C. J. Allday, Fotheringhay Manor, Peterborough, for **Royal Foggathorpe Prince** 253153, roan, born Nov. 4, bred by D. Jopson, Ormathwaite Hall, Keswick; *s.* Royal Oak 211121, *d.* 98551 Orma Foggathorpe *by* Wild Eyes Prince 212551.

1001 III.—Robert N. Tory, Anderson, Blandford, for **Anderson Imperial Cran** 248340, roan, born Feb. 13, bred by Debenham & Tory, Anderson, Blandford; *s.* Anderson Imperial Minstrel 2nd 234697, *d.* 118714 Anderson Darlington Cran 5th *by* Anderson Champion Bates 186667.

990 IV.—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon White Duke** 251445, white, born May 29; *s.* Thelveton Wild General 240702, *d.* 110433 Thelveton Duchess 2nd *by* Histon Lord Barrington 5th 216356.

991 R.N.—Sir Mark Collet, Bart., St. Clere, Kemsing, Sevenoaks, for **St. Clere Lord Darlington.**

H.C.—993.

Class 129.—*Dairy Shorthorn Bulls, born on or between January* 1 *and March* 31, 1932.

1009 I.—Thomas Jackson Hughes, Fulford Farm, Blythe Bridge, Stoke-on-Trent, for **Embleton Supreme,** roan, born March 8, bred by W. Browell, Wad Cragg, Embleton, Cockermouth; *s.* Orma Rosette Prince 3rd 225338, *d.* 71165 Embleton Mayflower 4th *by* Thursby Prince 159956.

1005 II.—Sir Mark Collet, Bart., St. Clere, Kemsing, Sevenoaks, for **St. Clere Celebrity,** roan, born Feb. 12; *s.* Greattew Waterloo 223446, *d.* 73760 Heggle Grace Flower 3rd *by* Leeming Duke 182477.

1008 III.—F. S. Francis, Wilkinthroop Farm, Templecombe, Somerset, for **Throop Otus,** white, born Jan. 10; *s.* Seaplane 233426, *d.* 34598 Thurnham Telluria 2nd *by* Loobagh Duke 3rd 157824.

1006 IV.—Sir Mark Collet, Bart., for **St. Clere Masterkey,** dark roan, born Jan. 12; *s.* Harehill St. Bardolph 2nd 230740, *d.* 59659 St. Clere Butterfly 3rd *by* St. Clere Minstrel 175870.

1007 R.N.—J. Onslow Fane, Steventon Manor, Hants., for **Steventon Fire Drake.**

Class 130.—*Dairy Shorthorn Bulls, born on or between April* 1 *and June* 30, 1932.[2]

1027 **I. & R.N. for Champion.**[3]—E. McGregor, Manor Farm, Lillington, Leamington, for **Wreay Wild King 2nd,** dark roan, born April 18, bred by W. Jackson & Son, The Wreay, Wigton; *s.* Wreay Pilate 234517, *d.* 109234 Wreay Wild Eyes 2nd *by* Wreay Wild Eyes King 220176.

1029 **II. & R.N. for Special.**[4]—Major G. Miller Mundy, Red Rice, Andover, for **Redrice Darlington Lad,** roan, born June 8; *s.* Redrice Craggsman 246629, *d.* 111148 Redrice Darling 2nd *by* Longhills Lord Price 200551.

1034 III.—W. J. Whitehand, Old Hall, South Walsham, Norwich, for **Southwalsham Talisman 2nd,** roan, born May 27; *s.* Foxhill Talisman 237185, *d.* 101751 Hinchinbrooke Mistletoe 2nd *by* Foxhill Wild Pearl 189841.

1016 IV.—Sir Mark Collet, Bart., St. Clere, Kemsing, Sevenoaks, for **St. Clere Royal Bandit,** dark roan, born June 1; *s.* Ightham Dairyman 244898, *d.* 116851 St. Clere Isabelle *by* Harberwain Bellman 199295.

1024 V.—Sir William Hicking, Bart., Brackenhurst Hall, Southwell, for **Brackenhurst Royal Rosador,** roan, born May 27; *s.* Brackenhurst Jeanson 242298, *d.* 90360 Debden Rose *by* Rushcourt Bandit 2nd 202584.

1032 R.N.—Robert N. Tory, Anderson, Blandford, for **Imperial Musician.**

1029, 1106, 1135 **Cup.**[1]—Major G. Miller Mundy, for **Redrice Darlington Lad, Redrice Helen** and **Redrice Oxford.**

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[1] The "Grendon" Silver Challenge Cup given through the Dairy Shorthorn Association for the best group of one Bull and two Cows or Heifers. Two at least of the animals must have been bred by the Exhibitor.

[2] Prizes, except Fourth and Fifth given by the Dairy Shorthorn Association.

[3] Champion Prize of £10 given by the Dairy Shorthorn Association for the best Bull.

[4] Special Prize of £10 given by the Dairy Shorthorn Association for the best Bull in Classes 129 to 131. The following cows in the pedigree of the Bull had to be registered, or provisionally accepted for registration, as qualified cows in the Dairy Shorthorn Association's Register: (1) the sire's dam and her dam, (2) the dam and her dam, and (3) the dam of the dam's sire.

Class 131.—*Dairy Shorthorn Bulls, born on or between July* 1 *and December* 31, 1932.

1050 **I. & Special.**[1]—Geoffrey R. H. Smith, Oxton Hall, Tadcaster, for **Oxton Wild Lord,** dark roan, born July 14; *s.* Ray of Hope 225829, *d.* 100595 Nancy Wild Eyes *by* Wild Eyes Marksman 195221.

1038 **II.**—Joseph Barnes, Barugh Syke, Wigton, for **Barugh Dairyman,** roan, born July 2; *s.* Harberwain Ore 230721, *d.* 115488 Barugh Crystal *by* Barugh Secret Star 228156.

1048 **III.**—E. McGregor, Manor Farm, Lillington, Leamington, for **Wreay Marquis,** dark roan, born Sept. 14, bred by W. Jackson & Son, The Wreay, Wigton; *s.* Wreay Pilate 234517, *d.* 119720 Wreay Dewdrop 8th *by* Ireby Warrior 223955.

1046 **IV.**—Lawrence Hignett, Hook End Farm, Checkendon, Reading, for **Checkendon Cardinal,** roan, born Aug. 26; *s.* Double Imperial 206832, *d.* 108603 Checkendon Carlisle 2nd *by* Ashe Wild Prince 3rd 204565.

1052 **V.**—S. Watney, Acryse Place, Folkestone, for **Deansbiggin Lord Charles,** roan, born Aug. 2, bred by J. H. Stephenson, Deansbiggin, Kirkby Lonsdale; *s.* Underley Lord Grey 240858, *d.* 104930 Underley Wild Lucy 2nd *by* Foxhill Royal Charles 189835.

H.C.—1047, 1053. **C.**—1043, 1054.

Class 132.—*Dairy Shorthorn Cows, in-milk, born on or before March* 31, 1927, *having yielded a minimum of* 8,000 *lb. of milk during a lactation period of* 315 *days.*[2]

1058 **I. & R.N. for Champion.**[3]—Lt.-Col. E. C. Atkins, Stretton House, Stretton Baskerville, Hinckley, for 84575 **Sizergh Queen,** roan, born Aug. 23, 1926, calved June 15, 1933, bred by C. Dobson, Low Sizergh, Helsington, Kendal; *s.* Hutton Defender 172595, *d.* 43350 Snotterton Queen *by* Aske Grandee 160856.

1067 **II.**—J. Spencer Taylor, Kirby, Whatcote, Shipston-on-Stour, for 85201 **Pinkneys Lilian,** roan, born April 10, 1926, calved May 22, 1933, bred by F. T. Fisher, Pinkneys Green, Maidenhead; *s.* Pinkneys Darlington Major 183845, *d.* 36290 Plaspower Lilian *by* Grendon Emperor 163771.

1057 **III.**—C. J. Allday, Fotheringhay Manor, Peterborough, for 82014 **Fothering Foggathorpe,** roan, born April 27, 1926, calved April 25, 1933; *s.* Barrowford Conjuror 161187, *d.* 2990 Dupplin Portia *by* Greenleaf's Blend 142747.

1063 **R.N.**—Sir William Hicking, Bart., Brackenhurst Hall, Southwell, for **Debden Rose.**

H.C.—1059, 1060. **C.**—1064.

Class 133.—*Dairy Shorthorn Cows, in-milk, born on or between April* 1, 1927, *and March* 31, 1928, *having yielded a minimum of* 8,000 *lb. of milk during a lactation period of* 315 *days.*

1071 **I. & Champion.**[3]—Sir William Hicking, Bart., Brackenhurst Hall, Southwell, for 101342 **Debden Cherry Bandeau,** roan, born July 17, 1927, calved June 1, 1933, bred by W. P. Robertson, Debden, Saffron Walden; *s.* Rushcourt Bandit 2nd 202534, *d.* 30856 Cherry Lass 3rd *by* Knowsley Beau Brocade 137424.

1076 **II.**—Geoffrey R. H. Smith, Oxton Hall, Tadcaster, for 114766 **Evenhill Fairy Maid,** white, born March 25, 1928, calved May 22, 1933, bred by J. Wood, Evening Hill, Thursby, Carlisle; *s.* Evenhill Favourite 2nd 215412, *d.* 68207 Holme Fairy Maid *by* Girlie's Milk Lad 190002.

1073 **III.**—Lawrence Hignett, Hook End Farm, Checkendon, Reading, for 108606 **Checkendon Lady Nottingham,** roan, born Jan. 26, 1928, calved May 21, 1933; *s.* Ashe Wild Prince 3rd 204565, *d.* 1032 Grendon Lady Tibby *by* Lord Nottingham 116317.

1079 **R.N.**—The Duke of Westminster, G.C.V.O., D.S.O., Eaton Home Farm, Aldford, Chester, for **Lawnhead Moss Rose 24th.**

1078, 1079, 1114 **Cup.**[4]—The Duke of Westminster, G.C.V.O., D.S.O., for **Lawnhead Moss Rose 20th, Lawnhead Moss Rose 24th and Lawnhead Charming Lass 9th.**

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[1] Special Prize of £10 given by the Dairy Shorthorn Association for the best Bull in Classes 129 to 131. The following cows in the pedigree of the Bull had to be registered, or provisionally accepted for registration, as qualified cows in the Dairy Shorthorn Association's Register: (1) the sire's dam and her dam, (2) the dam and her dam, and (3) the dam of the dam's sire.

[2] Prizes given by the Shorthorn Society.

[3] Champion Prize of £10, given by the Shorthorn Society for the best Cow or Heifer. A Silver Medal is given by the Shorthorn Society to the Breeder of the Champion Dairy Shorthorn Cow.

[4] Perpetual Silver Challenge Cup and a cash prize of £40, given through the Dairy Shorthorn Association, for the best group of three Cows or Heifers, by the same sire. The sire must be living in the British Isles, and have produced living progeny in 1933. A cash prize of £10 was awarded in respect of the Reserve Group and a small replica of the Cup was given, through the Dairy Shorthorn Association, to the owner of the sire winning the Cup.

Class 134.—*Dairy Shorthorn Cows, in-milk, born on or between April* 1, 1928, *and March* 31, 1929, *having yielded a minimum of* 6,500 *lb. of milk during a lactation period of* 315 *days.*

1082 I.—Capt. T. Allen-Stevens, Wicklesham Lodge, Faringdon, for 123881 **Hastoe Fairy 4th**, red and little white, born Feb. 9, 1929, calved June 20, 1933, bred by J. Timberlake, Hastoe Farm, Tring; *s.* Double Imperial 206832, *d.* 18910 Hastoe Fairy *by* Freshwater Orlando 142474.

1099 II.—G. Wooster, Pennbury Farm, Penn, Bucks., for 125054 **Pennbury Princess 6th**, red, born Feb. 7, 1929, calved April 18, 1933; *s.* Pennbury Foundation Stone 218105, *d.* Lady Princess *by* Lord Leicester 30th 191713.

1084 III.—Frederick Chapman, Chevet Grange, Wakefield, for 118073 **Knells Elliot Twig**, red, born Feb. 10, 1929, calved June 15, 1933, bred by C. Fisher, Knells Farm, Carlisle; *s.* Favourite Blend 180751, *d.* Knells Elliot Rosie 2nd *by* Walby Dairy King 194903.

1092 IV.—J. Timberlake, Hastoe Farm, Tring, for 123876 **Hastoe Bective 4th**, red, born March 11, 1929, calved April 8, 1933; *s.* Double Imperial 206832, *d.* 91901 Hastoe Bective 2nd *by* Broadfields Fearless 196741.

1097 V.—The Duke of Westminster, G.C.V.O., D.S.O., Eaton Home Farm, Aldford, Chester, for 114056 **Lawnhead Quicklime 3rd**, red and little white, born May 10, 1928, calved June 4, 1933, bred by J. Washington Wardle, Great Bridgeford, Stafford; *s.* Eaton Rose King 207056, *d.* 43856 Quicklime 11th *by* Lawnhead Cavalier 182413.

1083 R.N.—Lt.-Col. E. C. Atkins, Stretton House, Stretton Baskerville, Hinckley, for **Baskerville Grey.**

H.C.—1087, 1091.

Class 135.—*Dairy Shorthorn Cows or Heifers, in-milk, born on or after April* 1, 1929. *Cows that have completed a* 315 *days' lactation period must have yielded a minimum of* 5,500 *lb. of milk.*

1104 I.—F. S. Francis, Wilkinthroop, Templecombe, for 116122 **Cheston Wild Queen 3rd**, roan, born June 1, 1929, calved June 4, 1933, bred by William Brown, Chesterton Priory, Peterborough; *s.* King Hunter 216793, *d.* 71237 Cheston Wild Queen *by* Foggathorpe Premier 163306.

1106 II.—Major G. Miller Mundy, Red Rice, Andover, for 121519 **Redrice Helen**, white, born Nov. 1, 1929, calved May 19, 1933; *s.* Grendon Barrister 223477, *d.* 8669 Ingmire Helen *by* Baron Bridekirk 63rd 140761.

1110 III.—J. Spencer Taylor, Kirby, Whatcote, Shipston-on-Stour, for 123691 **Whatcote Rosamond**, red roan, born July 6, 1929, calved June 10, 1933; *s.* Longhills Drusus 224599, *d.* 57449 Sorbrook Rosamond 2nd *by* Foggathorpe Premier 163306.

1109 R.N.—J. Spencer Taylor, for **Redstone Elegance 2nd.**

H.C.—1103, 1114. **C.**—1108, 1115, 1116.

1115, 1116, 1151 R.N. for Cup.[1]—G. Wooster, for **Pennbury Barrington Duchess 2nd, Pennbury Barrington Duchess 3rd and Pennbury Greenleaf.**

Class 136.—*Dairy Shorthorn Heifers, in-milk to first calving, born on or after April* 1, 1930.[2]

1135 I.—Major G. Miller Mundy, Red Rice, Andover, for 131618 **Redrice Oxford**, roan, born Oct. 14, 1930, calved May 20, 1933; *s.* Anderson Wild Bates 212935, *d.* 66114 Hadnock Oxford *by* Lock Somerset 2nd 164885.

1129 II.—Hobbs & Davis, Kelmscott, Lechlade, for 129454 **Kelmscott Orange 68th**, red and little white, born June 7, 1930, calved April 27, 1933; *s.* Sorbrook Foggathorpe Premier 3rd 219269, *d.* 25451 Orange 58th *by* Crême de Menthe 119683.

1131 III.—A. Thomas Loyd, Lockinge House, Wantage, for 130580 **Lockinge Countess 6th**, red, born June 18, 1930, calved May 7, 1933; *s.* Lockinge Bandit 3rd 209160, *d.* 26806 Burghfield Countess 3rd *by* Gainford Dairy Benefactor 148975.

1120 R.N.—Sir Mark Collet, Bart., St. Clere, Kemsing, Sevenoaks, for **St. Clere Daffodil 13th.**

H.C.—1145, 1148. **C.**—1150, 1151.

Lincolnshire Red Shorthorns.

Class 137.—*Lincolnshire Red Shorthorn Bulls, born in or before* 1931.

1155 **I. & Champion.**[3]—Ancell B. Holt, Broughton Grange, Brigg, for **Seaholm Exchequer** 26129, born June 29, 1931, bred by E. S. Tansley, Bramcote Hills, Nottingham; *s.* Anwick Exchequer 28424, *d.* Cockerington 148 *by* Petwood Normanby 19700.

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[1] Perpetual Silver Challenge Cup and a cash prize of £40 given through the Dairy Shorthorn Association, for the best group of three Cows or Heifers, by the same sire. The sire must be living in the British Isles, and have produced living progeny in 1933. A Cash prize of £10 was awarded in respect of the Reserve Group and a small replica of the Cup was given, through the Dairy Shorthorn Association, to the owner of the sire winning the Cup.

[2] Prizes given by the Dairy Shorthorn Association.

[3] Champion Silver Challenge Cup given by the Lincolnshire Red Shorthorn Association for the best Bull.

1158 **II. & R.N. for Champion.**[1]—E. S. Tansley, Bramcote Hills, Nottingham, for **Cockerington Normanby 57th 24430**, born Jan. 5, 1929, bred by J. W. Needham & Sons, South Cockerington, Louth; *s.* Petwood Normanby 19700, *d.* Cockerington No. 52 *by* Pendley Result 13748.

1152 **III.**—William Buchanan, Villa Farm, Rempstone, Loughborough, for **Melton Reformer 23891**, born Dec. 29, 1927, bred by J. B. Riggall, Melton Ross, Barnetby; *s.* Anderby Red Pole 15112, *d.* Melton Rouge 11th *by* Langton Grange King 16646.

1153 **R.N.**—W. Dennis & Sons, Ltd., Kirton, Boston, for **Broombriggs Victor.**

Class 138.—*Lincolnshire Red Shorthorn Bulls, born in* 1932.

1161 **I.**—J. G. McDougall, Chippinghurst Manor, Cuddesdon, Oxon., for **Anderby John 26356**, born March 31, bred by J. M. Robinson & Son, Anderby Bank, Alford, Lincs.; *s.* Tathwell Crimson Coat 24105, *d.* Anderby Gift *by* Melton Laughter 18728.

1162 **II.**—E. S. Tansley, Bramcote Hills, Nottingham, for **Seaholm Bob 6th 26724**, born May 28; *s.* Anderby Bob 24281, *d.* Cockerington No. 137 *by* Petwood Normanby 19700.

Class 139.—*Lincolnshire Red Shorthorn Cows or Heifers, in-milk, born in or before* 1930.[2]

1171 **I. & R.N. for Champion.**[3]—J. A. Marsden Popple, Danes Hill, Stevenage, for **Beacon Hill Dina 2nd** (Vol. 35, p. 359), born March 19, 1928, calved May 21, 1933, bred by Col. C. de Paravicini, Birkholme Manor, Corby, Lincs.; *s.* Anwick Victor 7th 19121, *d.* Beacon Hill Dina *by* Cockerington Anderby 16282.

167 **II.**—H. Gore Browne, Broombriggs, Woodhouse Eaves, Loughborough, for **Broombriggs Tess** (Vol. 36, p. 216), born May 29, 1929, calved March 7, 1933; *s.* Saltfleet Waterloo 22442, *d.* Broombriggs Rachel *by* Swineshead Bill 20798.

1169 **III.**—John Evens & Son, Burton, Lincoln, for **Burton Royal Starlight 13th** (Vol. 35, p. 293), born April 20, 1927, calved May 11, 1933; *s.* Burton Ruby King 5th 20142, *d.* Burton Royal Starlight 10th *by* Scampton Recruit 12874.

1166 **R.N.**—S. Cecil Armitage, Lenton Fields, Nottingham, for **Welbourn Daisy 25th.**

Class 140.—*Lincolnshire Red Shorthorn Cows, in-milk, born in or before* 1928, *showing the best milking properties.*

1180 **I.**—Scothern Dairy Co., Scothern Manor, Lincoln, for **Scothern Vixen 7th** (Vol. 34, p. 228), born Jan. 27, 1927, calved June 16, 1933, bred by B. G. Bowser, Nettleham, Lincoln; *s.* Scothern Fascination 19776, *d.* Scothern Vixen 3rd *by* Welbourn Surprise 15018.

1177 **II.**—Col. the Rt. Hon. John Gretton, M.P., Stapleford Park, Melton Mowbray, for **Flamville Dairymaid 246th** (Vol. 35, p. 260), born March 27, 1928, calved May 4, 1933, bred by J. O. Burchnall, Aston Flamville; *s.* Flamville Acrobat 94th 22149, *d.* Flamville Dairymaid 221 *by* Flamville Baron 19396.

1175 **III.**—John Evens & Son, Burton, Lincoln, for **Burton Priory Lady 7th** (Vol. 35, p. 293), born June 16, 1927, calved May 28, 1933; *s.* Whetstone Bendish 3rd 21791, *d.* Burton Priory Lady 6th *by* Burton Royal Son 17382.

1181 **R.N.**—Russell Wood, Bendish House, Hitchin, for **Bendish Cherry 27th.**

H.C.—1174.

Class 141.—*Lincolnshire Red Shorthorn Cows or Heifers, in-milk, born in or after* 1929, *showing the best milking properties.*[2]

1186 **I.**—Russell Wood, Bendish House, Hitchin, for **Bendish Nancy 18th** (Vol. 36, p. 363), born Nov. 12, 1929, calved June 5, 1933; *s.* Ketteringham Milkman 19549, *d.* Bendish Nancy 5th *by* Burton Ruby King 2nd 14314.

1185 **II.**—John Evens & Son, Burton, Lincoln, for **Burton Vic 26th** (Vol. 37, p. 244), born May 11, 1929, calved May 23, 1933; *s.* Burton Diligence 3rd 22802, *d.* Burton Vic 21st *by* Burton Supreme 18368.

1187 **III.**—Russell Wood, for **Bendish Pansy 20th** (Vol. 37, p. 339), born June 4, 1930, calved May 29, 1933; *s.* Ketteringham Milkman 19549, *d.* Bendish Pansy 8th *by* Burton Ruby King 2nd 14314.

1184 **R.N.**—John Evens & Son, for **Burton Ruby 36th.**

Class 142.—*Lincolnshire Red Shorthorn Heifers, born in* 1931.

1191 **I. & Champion.**[3]—H. Gore Browne, Broombriggs, Woodhouse Eaves, Loughborough, for **Broombriggs Venetia** (Vol. 38, p. 201), born April 25; *s.* Saltfleet Waterloo 22442, *d.* Broombriggs Selina *by* Saltfleet Waterloo 22442.

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[1] Champion Silver Challenge Cup given by the Lincolnshire Red Shorthorn Association for the best Bull.

[2] Prizes given by the Lincolnshire Red Shorthorn Association.

[3] Champion Silver Challenge Cup given by the Lincolnshire Red Shorthorn Association for the best Cow or Heifer.

1192 II.—H. Gore Browne, for **Broombriggs Veronica** (Vol. 38, p. 201), born June 5; *s.* Saltfleet Waterloo 22442, *d.* Broombriggs Rachel *by* Swineshead Bill 20798.

1194 III.—J. G. McDougall, Chippinghurst Manor, Cuddesdon, Oxon., for **Broombriggs Virtue** (Vol. 38, 201), born May 11, bred by H. Gore Browne, Broombriggs, Woodhouse Eaves; *s.* Saltfleet Waterloo 22442, *d.* Broombriggs Rosamund *by* Swineshead Bill 20798.

1195 R.N.—Henry C. Raithby, Manor House, Ludborough, North Thoresby, for **Ruby 23rd.**

Class 143.—*Lincolnshire Red Shorthorn Heifers, born in* 1932.

1200 I.—J. G. McDougall, Chippinghurst Manor, Cuddesdon, Oxon., for **Chippinghurst Peggy**, born May 10; *s.* Chetwode Hugh 21623, *d.* Saltfleet Madge (Vol. 34, p. 280) *by* Scothern Quality 21623.

1201 II.—E. S. Tansley, Bramcote Hills, Nottingham, for **Seaholm Tulip**, born May 2; *s.* Cockerington Normanby 57th 24430, *d.* Stoke Hannah (Vol. 29, p. 263) *by* Poolham Liberator 15724.

1198 III.—H. Gore Browne, Broombriggs, Woodhouse Eaves, Loughborough, for **Broombriggs Waltz**, born June 16; *s.* Saltfleet Waterloo 22442, *d.* Broombriggs Rachel (Vol. 33, p. 257) *by* Swineshead Bill 20798.

1199 R.N.—H. Gore Browne, for **Broombriggs Wistful**, born Feb. 9; *s.* Saltfleet Waterloo 22442, *d.* Broombriggs Rosalind (Vol. 33, p. 257) *by* Swineshead Bill 20798.

South Devons.

Class 144.—*South Devon Bulls, born in or before* 1931.

1204 I.—John Rossiter, Cholwells, Kingsbridge, Devon, for **Harestone Gladiator 12819**, born April 16, 1930, bred by Henry Chaffe, Harestone, Brixton, Devon; *s.* Merryman 11181, *d.* Harestone Gladys 18th 32140 *by* Keaton Prince 3rd 9854.

1203 II.—W. Pedrick & Son, Cholwell, Harberton, Devon, for **Wear Lad 12364**, born Oct. 19, 1928, bred by J. Coaker & Son, Wear, Bishopsteignton, Devon; *s.* Wear Perfection 11936, *d.* Buckland Favourite 29717 *by* Englebourne Boy 9778.

1202 III.—John T. Dennis, Winsor, Yealmpton, Devon, for **Charleton No. 58 12417**, born Oct. 16, 1929, bred by J. L. Cornish, Charleton, Kingsbridge; *s.* Flete Forester 6th 11443, *d.* Bertha 26627 *by* Lixton Councillor 11th 9268.

Class 145.—*South Devon Bulls, born in* 1932.

1207 I.—Richard W. Chaffe, Worswell Barton, Revelstoke, Newton Ferrers, for **Worswell Guardsman 13408**, born July 19; *s.* Berry Prince 9th 12692, *d.* Worswell Gladys 22nd 35240 *by* Flete Prince 10235.

1208 II.—John Wakeman, Rowden, Newton Ferrers, for **Rowden Rupert 9th 13362**, born April 5; *s.* Rupert 12338, *d.* Rowden Locket 34291 *by* Cadet 11366.

Class 146.—*South Devon Cows or Heifers, in-milk, born in or before* 1930.

1214 I.—John T. Dennis, Winsor, Yealmpton, Devon, for **Flete Edna 35663**, born April 10, 1930, calved Sept. 6, 1932, bred by Lord Mildmay of Flete, Flete, Ermington; *s.* Englebourne No. 20 12225, *d.* Flete Sylvia 33454 *by* Widland No. 1 10077.

1215 II.—John Rossiter, Cholwells, Kingsbridge, Devon, for **Gentle 31679**, born July 7, 1925, calved Feb. 26, 1933; *s.* Rent Payer 10856, *d.* Grateful 27552 *by* Pansy's Napoleon 9362.

1209 III.—Richard W. Chaffe, Worswell Barton, Revelstoke, Newton Ferrers, for **Worswell Cornflower 4th 33067**, born Jan. 6, 1927, calved Nov. 12, 1932; *s.* Henry 11126, *d.* Worswell Cornflower 2nd 28198 *by* Lixton Councillor 2nd 7868.

1216 R.N.—Miss Jervoise Smith, Sandwell, Harberton, Totnes, for **Daffodil.**

Class 147.—*South Devon Heifers, born in* 1931 *or* 1932.[1]

1219 I.—John T. Dennis, Winsor, Yealmpton, Devon, for **Coleridge Flirt 37326**, born Jan. 21, 1932, bred by T. S. Walters-Symons, Lower Coleridge, Kingsbridge; *s.* Rydon King 3rd 11901, *d.* Coleridge Blanche 34326 *by* Coleridge Model 11054.

1220 II.—Mrs. Ellen Ford, Wrenwell Farm, Denbury, Newton Abbot, for **Wrenwell Rosaleen C. 236**, born Jan. 2, 1931; *s.* Rowden Cadet 10th 12332, *d.* Arosa B. 10 *by* Compton Cowboy 11061.

1221 III.—John Wakeham, Rowden, Newton Ferrers, for **Rowden Lavender 36638**, born Feb. 2, 1931; *s.* Cadet 11366, *d.* Lovely 20747 *by* Spriddlescombe Napoleon 4590.

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[1] Prizes given by the South Devon Herd Book Society.

Red Polls.

Class 148.—*Red Poll Bulls, born in or before* 1930.

1228 **I. & Champion.**[1]—S. E. Radford, Algar House, Fersfield, Diss, for **Mickleover Red Fox** 15049, born Aug. 3, 1928, bred by A. Preston Jones, Mickleover, Derby; *s.* Glevering Heron 13389, *d.* 30679 Ashmoor Vixen *by* Aspall Eros 6th 11875.

1225 **II.**—Sir M. E. Manningham Buller, Bart., Charlton Lodge, Banbury, for **Didlington Dandy** 15289, born July 23, 1929, bred by the Didlington Estates Co., Didlington; *s.* Framlingham Count 14494, *d.* 37325 Didlington Dewdrop 3rd *by* Didlington Daylight 12589.

1223 **III.**—Lt.-Col. R. C. Batt, C.B.E., M.V.O., Gresham Hall, Norwich, for **Lichfield Red Rover** 14983, born Jan. 15, 1928, bred by E. B. Moore, Home Farm, Somerleyton; *s.* Gaddesby Gauntlett 12620, *d.* 30152 Lichfield Red Rose 2nd *by* Churwell Red Skin 11586.

1222 **R.N.**—Major J. S. Agnew, Rougham, Bury St. Edmunds, for **Basildon Roseboy.**
H.C.—1227.

Class 149.—*Red Poll Bulls, born in* 1931.

1238 **I. & R.N. for Champion.**[1]—J. N. Kendall, Brimpsfield Park, Glos., for **Brimpsfield Bonaparte** 16025, born June 7; *s.* Brimpsfield Barrister 14456, *d.* 37857 Ladyswood Maude *by* Langham Prince 12710.

1240 **II.**—The Earl of Stradbroke, Henham Hall, Wangford, Suffolk, for **Henham Caesar** 16440, born March 2; *s.* Wissett Quartermaster 14727, *d.* 39514 Henham Corona *by* Hutton Assessor 13067.

1230 **III.**—Lt.-Col R. C. Batt, C.B.E., M.V.O., Gresham Hall, Norwich, for **Gresham Mussolini** 16426, born July 12; *s.* Litchfield Red Rover 14983, *d.* 34018 Gresham Mayfly *by* Basildon Royal 11882.

1234 **IV.**—Capt. Sir H. E. de Trafford, Bart., Newsells Park, Barkway, Royston, for **Newsells Mollyson** 16224, born April 20; *s.* Wanstead Crimson 13605, *d.* 38242 Ranksborough Molly *by* Hatton Fabulist 11985.

1239 **R.N.**—Stuart Paul, Kirton Lodge, Ipswich, for **Kirton May King.**
H.C.—1232, 1237.

Class 150.—*Red Poll Bulls, born on or between January* 1 *and May* 31, 1932.

1247 **I.**—Mrs. C. N. Dyer, Hyders, Crawley, for **Hyders Tenderfoot**, born Jan. 24; *s.* Ashmoor Alert 13284, *d.* 34012 Grauntcourts Tenderness *by* Fordend Wonder 12609.

1245 **II.**—Lady Chesham, Latimer, Chesham, Bucks., for **Latimer Duke 2nd** 16472, born May 21; *s.* Latimer Minstrel 15779, *d.* 39774 Latimer Moggy *by* Theobalds Duke 13237.

1253 **III.**—Lady Loder, Leonardslee, Horsham, for **Leonardslee Eastern Lord** 16475, born Feb. 14; *s.* Sporle Eastward Ho 15132, *d.* 36077 Lichfield Lucy 8th *by* Gaddesby Gauntlet 12620.

1248 **IV.**—John George Gray, Coombe Abbey, Coventry, for **Abbeycombe Henchman** 16312, born Feb. 19; *s.* Tittleshall Arravale 13952, *d.* 35216 Basildon Pear 2nd *by* Basildon Clansman 12919.

1250 **R.N.**—Sir Guy Hambling, Bart., Rookery Park, Yoxford, Suffolk, for **Yoxford Rex.**
H.C.—1254, 1255.

Class 151.—*Red Poll Bulls, born on or between June* 1 *and December* 31, 1932.[2]

1265 **I.**—Stuart Paul, Kirton Lodge, Ipswich, for **Fersfield Red Fox 9th** 16406, born June 15, bred by S. E. Radford, Algar House, Fersfield, Diss; *s.* Mickleover Red Fox 15049, *d.* 30763 Arwarton Mystery 4th *by* Bredfield Monarch 12539.

1267 **II.**—The Hon. Clive Pearson, Parham, Pulborough, for **Parham Kingfisher**, born June 5; *s.* Basildon Rodney 13295, *d.* 40622 Whiteway Widgeon *by* Seven Springs Bumble Bee 13922.

1270 **III.**—Viscount Tredegar, Tredegar Park, Newport, Mon., for **Tredegar Knight** 16581, born Oct. 3; *s.* Tredegar Handsome 15925, *d.* 46309 Tredegar Hallmark *by* Necton Gloucester 11423.

1268 **IV.**—Capt. Alan Richardson, Seven Springs Farm, Cheltenham, for **Seven Springs Que Bracho** 16553, born July 4; *s.* Meddler Full Cry 13138, *d.* 33144 Seven Springs Quinine *by* Knepp Ajax 11397.

1262 **R.N.**—Sir Guy Hambling, Bart., Rookery Park, Yoxford, for **Yoxford Firefly.**
H.C.—1260.

Class 152.—*Red Poll Cows, in-milk, born in or before* 1927.

1274 **I. & Champion.**[3]—Mrs. M. L. Griffith, Little Hallingbury Park, Essex, for 37525 **Grundisburgh Ruby**, born Sept. 30, 1926, calved May 22, 1933, bred by Lord Cranworth, Grundisburgh; *s.* Gresham Mainstay 13030, *d.* 30687 Assington Diamond *by* Melton Prosper 11740.

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[1] Champion Prize of £5 given by the Red Poll Cattle Society for the best Bull.
[2] Prizes, except Fourth, given by the Red Poll Cattle Society.
[3] Champion Prize of £5 given by the Red Poll Cattle Society for the best Cow or Heifer.

1271 **II. & R.N. for Champion.**[1]—HIS MAJESTY THE KING, Sandringham, Norfolk, for **32960 Necton Daffodil**, born Sept. 18, 1923, calved Feb. 25, 1933, bred by R. Harvey Mason, Necton Hall, Swaffham; *s.* Marham Armistice 11410, *d.* 26401 Necton Dolores *by* Shrewsbury 10489.

1280 **III.**—OWEN H. SMITH, Langham, Oakham, for **32812 Lois Peridot**, born Feb. 26, 1928, calved May 5, 1933, bred by Major C. O. E. Nicholson, Lois Weedon House, Towcester; *s.* Warwick King 11554, *d.* 23098 Lowther Peridot *by* Letton Vanity Davyson 2nd 10050.

1281 **R.N.**—OWEN H. SMITH, for **Upton Queen B.**

H.C.—1276. **C.**—1279.

Class 153.—*Red Poll Cows or Heifers, in-milk, born in* 1928, 1929, *or* 1930.[2]

1286 **I.**—JOHN GEORGE GRAY, Coombe Abbey, Coventry, for **40819 Basildon Royal Rosie 8th**, born Oct. 14, 1928, calved Feb. 19, 1933, bred by Major J. A. Morrison, D.S.O., Basildon Park, Reading; *s.* Basildon Regulator 14026, *d.* 30733 Basildon Royal Rosie *by* Sudbourne Miner 11492.

1287 **II.**—LADY LODER, Leonardslee, Horsham, for **41933 Mickleover Minnow**, born Sept. 27, 1928, calved April 29, 1933, bred by A. Preston Jones, Mickleover, Derby; *s.* Gaddesby Edward 14118, *d.* 36724 Upton Minnow *by* Wykeham Stormer 12482.

1283 **III.**—HIS MAJESTY THE KING, Sandringham, Norfolk, for **42157 Royal Lent Lily**, born Aug. 14, 1928, calved Feb. 4, 1933; *s.* Royal Rambler 14298, *d.* 32960 Necton Daffodil *by* Marham Armistice 11410.

1288 **R.N.**—STUART PAUL, Kirton Lodge, Ipswich, for **Meddler Setfair.**

H.C.—1285.

Class 154.—*Red Poll Heifers, born in* 1931.

1292 **I.**—CHARLES HENRY CEARN, Gatwick Farm, Upper Gatton, Reigate, for **46566 Ashmoor Northernlight**, born March 5, bred by A. Carlyle Smith, Sutton Hall, Woodbridge; *s.* Hardwick Rex 2nd 14923, *d.* 35290 Blyth Starlight *by* Aspall Citizen 11259.

1291 **II.**—HIS MAJESTY THE KING, Sandringham, Norfolk, for **48007 Royal Amaryllis**, born April 19; *s.* Hatton Faber 14151, *d.* 42157 Royal Lent Lily *by* Royal Rambler 14298.

1299 **III.**—CAPT. C. S. SCHREIBER, Marlesford Hall, Woodbridge, for **47695 Marlesford Comedy**, born Jan. 25; *s.* Bredfield Peer 4th 14822, *d.* 34027 Grundisburgh Comedy *by* Framlingham Fanatic 12612.

1301 **R.N.**—THE EARL OF STRADBROKE, Henham Hall, Wangford, Suffolk, for **Henham Witch.**

H.C.—1293.

Class 155.—*Red Poll Heifers, born in* 1932.

1304 **I.**—SIR M. E. MANNINGHAM BULLER, BART., Charlton Lodge, Banbury, for **48897 Charlton Foam**, born March 3; *s.* Didlington Dandy 15289, *d.* 36089 Lois Foam 2nd *by* Bredfield Domino 12943.

1308 **II.**—HIS MAJESTY THE KING, Sandringham, Norfolk, for **50132 Royal Elf**, born Jan. 22; *s.* Hatton Faber 14151, *d.* 40228 Royal Fairy 2nd *by* Royal Crimson 11763.

1309 **III.**—MRS. C. C. COURTAULD, Froyz Hall, Halstead, for **49275 Froyz Opal**, born Feb. 1; *s.* Bredfield Domino 3rd 14444, *d.* 41367 Froyz Trinket *by* Helmons Hector 13785.

1310 **IV.**—CAPT. SIR H. E. DE TRAFFORD, BART., Newsells Park, Barkway, Royston, for **49969 Newsells Glad 2nd**, born March 12; *s.* Bredfield Darius 2nd 12942, *d.* 34263 Kirton Glad *by* Bredfield Regal 11569.

1307 **V.**—S. W. COPLEY, Deacon's Hill, Elstree, for **49078 Deacon's Beurre 3rd**, born Jan. 18; *s.* Framlingham Gondolier 15307, *d.* 43130 Deacon's Beurre *by* Cotswold Flavius 13347.

C.—1318.

Blue Albions.

Class 156.—*Blue Albion Bulls, born in or before* 1930.

1819 **I. & R.N. for Champion.**[3]—W. E. GLOVER, The Shrubberies, Snarestone, Burton-on-Trent, for **Snarestone Jester 1799**, born May 29, 1928; *s.* Barton Jude 2nd 1183, *d.* Snarestone Faith 7024.

1820 **II.**—HENRY MATTHEWS, Winterbourne, Bristol, for **Stow What's Wanted 1969**, born May 3, 1929, bred by T. H. Calderbank, Stow Maries, Chelmsford; *s.* Stow Maries 1579, *d.* Stow Cicely 11520 *by* Broomhill Threshold 499.

1821 **III.**—JAMES WALL, Bridge House, Rowsley, Derbyshire, for **Woodland King 1985**, born Aug. 29, 1930; *s.* Asherblue Clansman 1829, *d.* Hassop Queenie 11192 *by* Chariesworth Champion 259.

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[1] Champion Prize of £5 given by the Red Poll Cattle Society for the best Cow or Heifer.

[2] Prizes given by the Red Poll Cattle Society.

[3] Perpetual Silver Challenge Cup given by the Blue Albion Cattle Society for the best Bull.

Class 157.—*Blue Albion Bulls, born in* 1931.[1]

1822 I. & Champion.[2]—T. H. Calderbank, The Hall, Stow Maries, Chelmsford, for **Walden Manners**, born Jan. 12, bred by A. T. Greenslade, Little Walden Park, Saffron Walden; *s.* Chilcote Blue Boy 1505, *d.* Walden Clara 7650.

Class 158.—*Blue Albion Bulls, born in* 1932.[1]

1824 I.—W. E. Glover, The Shrubberies, Snarestone, Burton-on-Trent, for **Snarestone Jude**, born May 11; *s.* Snarestone Jester 1799, *d.* Snarestone Fashion 3rd 12376 *by* Barton Jude 2nd 1183.

1825 II.—Henry Matthews, Winterbourne, Bristol, for **Winterbourne Blue Boy**, born Feb. 29; *s.* Stow Victor, *d.* Winterbourne Emma *by* Broomhill Threshold 499.

Class 159.—*Blue Albion Cows or Heifers, in-milk, born in or before* 1930.

1827 I. & R.N. for Champion.[3]—W. E. Glover, The Shrubberies, Snarestone, Burton-on-Trent, for **Mount Crocus 3rd** 12782, born Aug. 11, 1929, calved May 4, 1933, bred by T. H. Swire & Sons, Mount Farm, Norton-in-Hales, Market Drayton; *s.* Mount Fearless 1731, *d.* Mount Crocus 9598.

1832 II.—Charles Henry Webster, Ivonbrook Farm, Grange Mill, Wirksworth, for **Ivonbrook Vera** 12054, born July 20, 1927, calved June 3, 1933; *s.* Ivonbrook Prince 1018, *d.* Ivonbrook Treasure 10412 *by* Bank Conqueror 189.

1831 III.—Charles Henry Webster, for **Ivonbrook Lilac** 12050, born July 15, 1927, calved Oct. 10, 1932; *s.* Ivonbrook Prince 1018, *d.* Ryleys Poppy 6722.

1829 R.N.—James Wall, Bridge House, Rowsley, Derbyshire, for **Countess of Woodland.**
H.C.—1826. C.—1828.

Class 160.—*Blue Albion Heifers, born in* 1931.

1835 I.—Charles Henry Webster, Ivonbrook Farm, Grange Mill, Wirksworth, for **Ivonbrook Jane**, born March 5; *s.* Ivonbrook Masterpiece 1707, *d.* Ivonbrook Vera 12054 *by* Bank Conqueror 189.

1834 II.—W. E. Glover, The Shrubberies, Snarestone, Burton-on-Trent, for **Snarestone Mischief 4th**, born Oct. 22; *s.* Snarestone Jester 1799, *d.* Snarestone Mischief 2nd 10666 *by* Mountain Count 163.

1833 III.—John Bassett, Hill Top Farm, Ashover, Derbyshire, for **Asher Blue Blossom 3rd**, born Jan. 22; *s.* Asher Blue Clansman 1829, *d.* Asher Blue Blossom 10026 *by* Nottil John 335.

Class 161.—*Blue Albion Heifers, born in* 1932.[1]

1836 I. & Champion.[3]—John Bassett, Hill Top Farm, Ashover, Derbyshire, for **Asher Blue Daisy**, born Sept. 5; *s.* Asher Blue Clansman 1829, *d.* Pike Trixie 11268 *by* Bradbourne Masterpiece 2nd 457.

1838 II.—John Bassett, for **Asher Blue Pansy**, born Jan. 5; *s.* Asher Blue Clansman 1829, *d.* Asher Blue Barton 12534 *by* Barton Alderman 1607.

1839 III.—Charles Henry Webster, Ivonbrook Farm, Grange Mill, Wirksworth, for **Ivonbrook Empress**, born June 21; *s.* Winthorpe Major 1979, *d.* Ivonbrook Pansy 12052 *by* Ivonbrook Prince 1018.

British Friesians.

The letters F.R.S. after the number of an animal indicate that such animal is registered in the Friesch Rundvee Stamboek (Friesland Cattle Herd Book) Zwartebonte (Black and White) Section.

The letters F.H.B., S.A., after the number of an animal indicate that such animal is registered in the Friesland Herd Book, South Africa.

The letters S.A.S.B. after the name of an animal indicate that such animal is registered in the South African Stud Book.

The letters P.I. after the name of an animal indicate that such animal is of pure imported Friesian (Holland) or South African blood.

Unless otherwise stated the number refers to the British Friesian Herd Book.

Class 162.—*British Friesian Bulls, born in or before* 1930.[4]

1845 I., £20, Champion[5] & Champion.[6]—George Gee, Ely Grange, Frant, Tunbridge Wells, for **Douneside Marcellus** 84163, born Oct. 2, 1928, bred by Sir Alasdair W. McRobert, Bart., Douneside, Tarland; *s.* Douneside Pel Klaas 80901 P.I., *d.* Douneside Maris 92536 *by* Douneside Hatsummerschaap 13719 P.I.

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[1] Prizes given by the Blue Albion Cattle Society.

[2] Perpetual Silver Challenge Cup given by the Blue Albion Cattle Society for the best Bull.

[3] Perpetual Silver Challenge Cup given by the Blue Albion Cattle Society for the best Cow or Heifer.

[4] Prizes, except Fourth and Fifth, given by the British Friesian Cattle Society.

[5] Champion Prize of £10 given by the British Friesian Cattle Society for the best Bull.

[6] The "Mayford" Silver Challenge Trophy given through the British Friesian Cattle Society for the best Bull.

1349 **II., £15 & Champion.**[1]—Malcolm McIlchere, Cartside Farm, Thorntonhall, Lanarkshire, for **Kintyre Thorn** 36047, born Oct. 26, 1929; *s.* Seaton Ronnie 29849, *d.* Bonnington Heather 79112 *by* Loirston Bravo 20777.

1356 **III., £10.**—G. B. Radcliffe, Pool Bank, Tarvin, Chester, for **Tarvin Janke's Mairschaap** 33525 P.I., born May 1, 1927; *s.* Dunninald Haeayemairschaap 7699 P.I., *d.* Tarvin (imp. 1922) Beatty's Janke 66574 *by* Nels Rust Beatty 260 F.H.B.

1340 **IV. £4.**—E. G. Barton, Saundby, Retford, Notts., for **Saundby Crown Prince** 34955, born July 27, 1928; *s.* Routh Dutchman 6939 P.I., *d.* Thurston Karel Ecstasy 49384 *by* Kirkhill (imp.) Karel 2nd 4051.

1344 **V. £3.**—George Drakes, Midfield Farm, Humberston, Grimsby, for **Commieston Harold** 35507, born Feb. 12, 1929, bred by Andrew Spence, Commieston, Montrose; *s.* Royal Sietske Karel 33421 P.I., *d.* Commieston Derylette 91498 *by* Commieston Bromley Ceres 22379 P.I.

1351 **R.N.**—The Trustees of Sir A. W. McRobert, Bart., Douneside Home Farm, Tarland, Aberdeenshire, for **Douneside Bishop.**

H.C.—1347, 1354.

1356, 1383, 1475 **Trophy.**[2]—G. B. Radcliffe, for **Tarvin Janke's Mairschaap, Tarvin Warrior** and **Tarvin Wilful.**

Class 163.—*British Friesian Bulls, born on or between January* 1 *and June* 30, 1931.

1366 **I.**—Lord Rayleigh, The Bury, Hatfield Peverel, Chelmsford, for **Terling Cosmos** 39783 P.I., born May 24; *s.* Terling (imp. 1922) Marthus 21533, *d.* Terling Collona 5th 121786 P.I. *by* Bulkeley Klaske's Second Lodewijk 19423 P.I.

1362 **II.**—Frank William Gilbert, The Manor, Chellaston, Derby, for **Cliffordchambers Hugh** 38693 P.I., born June 15, bred by Mrs. Graham Rees-Mogg, Clifford Manor, Stratford-on-Avon; *s.* Darren Marthus 34099 P.I., *d.* Holyport Renceres 3rd 147740 P.I. *by* Holyport Serynte Cesar 31217 P.I.

1363 **III.**—Frank William Gilbert, for **Tarvin Undaunted** 39743, born Feb. 11, bred by G. B. Radcliffe, Pool Bank, Tarvin, Chester; *s.* Tarvin Janke's Mairschaap 33525 P.I., *d.* Tarvin Rosemary 132136 *by* Tarvin (imp. 1922) Mazeppa 21507.

1366, 1421, 1433 **R.N. for Trophy.**[2]—Lord Rayleigh, for **Terling Cosmos, Terling Profit 9th** and **Terling Breeze 34th.**

Class 164.—*British Friesian Bulls, born on or between July* 1 *and December* 31, 1931.

1368 **I., R.N. for Champion**[3] **& R.N. for Champion.**[4]—Frank William Gilbert, The Manor, Chellaston, Derby, for **Hamels Neptune** 39077, born Aug. 6, bred by E. Furness, Hamels Park, Buntingford; *s.* Hamels Lusty Lad 35881, *d.* Hamels Japonica 116886 *by* Hamels Paulus Potter 22989 P.I.

1369 **II.**—Frank William Gilbert, for **Herrington Lochinvar** 39155, born July 8, bred by Albert Weightman, Middle Herrington Dairy Farm, Sunderland; *s.* Herrington Initialad 34407, *d.* Herrington Ynte's Dairymaid 72308 *by* Brooklands Ynte 11145.

1371 **III.**—The Trustees of Sir A. W. MacRobert, Bart., Douneside Home Farm, Tarland, Aberdeenshire, for **Dennistoun Jeringa** 38811 P.I., born Sept. 5, bred by Mrs. McKendrick, Dennistoun, Kilmacolm; *s.* Moordale Ambassador 31555 P.I., *d.* Thurston Karel Jeltje 87980 P.I. *by* Kirkhill (imp.) Karel 2nd 4051.

1370 **R.N.**—W. H. R. Gilbert, The Cottage, Aston Flamville, Hinckley, for **Astonville Duke 11th.**

Class 165.—*British Friesian Bulls, born on or between January* 1 *and June* 30, 1932.

1375 **I. & R.N. for Champion.**[1]—Lord Glentanar, Glen Tanar, Aboyne, Aberdeenshire, for **Glentanar Barjen** 40523, born April 16; *s.* Glentanar Barjouk 35797 P.I., *d.* Bartonlecley Ena 78640 *by* Knebworth (imp. 1922) Ceres 20607.

1383 **II.**—G. B. Radcliffe, Pool Bank, Tarvin, Chester, for **Tarvin Warrior** 41319, born Jan. 17; *s.* Tarvin Janke's Mairschaap 33525 P.I., *d.* Tarvin Sunflower 141874 *by* Tarvin Janke's Mairschaap 33525 P.I.

1380 **III.**—John E. Moffitt, East House, Dalton, Northumberland, for **Terling Coloradus** 41331 P.I., born Feb 21, bred by Lord Rayleigh, Terling Place, Chelmsford; *s.* Terling (imp. 1922) Marthus 21533, *d.* Terling Collona 2nd 87774 P.I. *by* Terling (imp. 1922) Marthus 21533.

1374 **IV.**—Frank William Gilbert, The Manor, Chellaston, Derby, for **Prestbury Roland's Boy** 41057, born Feb. 7, bred by F. H. Cock, Prestbury Park, Cheltenham; *s.* Storridge Roland 7th 35001, *d.* Prestbury Flower 2nd 130888 *by* Brampton Pilot 27781.

1377 **R.N.**—D. R. Hodge & Sons, Wyddial Bury, Buntingford, for **Terling Matrix.**

H.C.—1372, 1378, 1379, 1381, 1384.

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[1] The "Douneside" Silver Challenge Cup given through the British Friesian Cattle Society for the best Bull, bred by Exhibitor.

[2] Perpetual Bronze Challenge Trophy given by the Friesland Cattle Breeders' Association of South Africa for the best group of three animals bred by Exhibitor.

[3] Champion Prize of £10 given by the British Friesian Cattle Society for the best Bull.

[4] The "Mayford" Silver Challenge Trophy given through the British Friesian Cattle Society for the best Bull.

Class 166.—*British Friesian Bulls, born on or between July* 1 *and December* 31, 1932.

1394 I.—The Trustees of Sir A. W. MacRobert, Bart., Douneside Home Farm, Tarland, Aberdeenshire, for **Douneside Benefactor 4th 40377**, born July 12 ; *s.* Douneside Masterpiece 19835, *d.* Douneside Bertus Minna 92514 *by* Douneside Hatsumerschaap 18719 P.I.

1389 II.—Frank William Gilbert, The Manor, Chellaston, Derby, for **Meridenvale Duke 40897**, born Sept. 17, bred by S. C. Arnold, Brailes Farm, Meriden, Coventry ; *s.* Chellaston Krael Bellman 37069, *d.* Steeple Duchess 3rd 131794 *by* Lund Beatty's Eros 29277.

1387 III.—The Trustees of Ethelbert Furness, Hamels Park, Buntingford, for **Hamels Old Lad 40599**, born Sept. 29, bred by the late E. Furness ; *s.* Hamels Lusty Lad 35881, *d.* Hamels Marigold 147234 *by* Glyndebourne Achilles 2nd 32777 P.I.

1386 IV.—E. Caudwell, Rowsley Hall Farm, Derbyshire, for **Peakland Alpha 41001**, born Oct. 17 ; *s.* Hache Cerynt Vulcan 17111 P.I., *d.* Hedon Be Bis Rubberoid 127820 by Lund Janke's Beatty 29281 P.I.

1392 V.—Ernest B. Hall, Hales Hall, Market Drayton, for **Hales Denarius 3rd 40577**, born July 3 ; *s.* Hales Chablis 37477, *d.* Hales Dinah 93970 *by* Dunninald Kurrijpjoh 13851 P.I.

1395 R.N.—Piddington (Northants.) Estates, Ltd., Horton, Northampton, for **Piddington Silver King.**

Class 167.—*British Friesian Cows, in-calf.*[1]

1405 I.—T. E. Gladstone, Margery Flatts, Lanchester, Co. Durham, for **Dignit Lucky Lass 115184**, born Dec. 4, 1927 ; *s.* Herrington Bradbury 17843 *d.* Hedges Lass 53476 *by* Haydon Dutch King 9829 P.I.

1402 II.—Frank William Gilbert, The Manor, Chellaston, Derby, for **Cart Gertie 113800**, born March 6, 1927, bred by John Craig, Linwood, Paisley ; *s.* Cart Lizard 27989, *d.* Cart Clara 69366 *by* Tantallon Stunner 15469.

1408 III.—J. R. Upson, Rush Court, Wallingford, for **Thurston Karel Emerald 2nd 76972**, born Jan. 20, 1923, bred by G. T. Eaton, Thurston Hall, Framfield, Sussex ; *s.* Kirkhill (imp.) Karel 2nd 4051, *d.* Thurston Emerald 49372 *by* Coldhayes King Ferdinand 6059.

1404 R.N.—W. H. R. Gilbert, The Cottage, Aston Flamville, Hinckley, for **Astonville Ada.**

H.C.—1400. 1401, 1403. C.—1406.

1402, 1416, 1463 R.N. for Cup.[2]—F. W. Gilbert, for **Cart Gertie, Winterbourne Dotterell 2nd** and **Harperadams Honesty 3rd.**

Class 168.—*British Friesian Cows, in-milk, born in or before* 1927, *having yielded a minimum of* 8,000 *lb. of milk during a lactation period of* 315 *days.*[1]

1421 I., £20 & Champion.[3]—Lord Rayleigh, The Bury, Hatfield Peverel, Chelmsford, for **Terling Profit 9th 121872**, born July 2, 1927, calved May 22, 1933 ; *s.* Terling Marjel 30013 P.I., *d.* Terling Profit 7th 99270 *by* Dunninald Haeayemairschaap 7699 P.I.

1426 II., £15 & R.N. for Champion.[3]—J. R. Upson, Rush Court, Wallingford, for **Moulsoe Elsie 2nd 108184**, born Jan. 12, 1926, calved April 13, 1933, bred by Randall Bros., Moulsoe, Newport Pagnell ; *s.* Moulsoe Golden King 18087, *d.* Moulsoe Elsie 74336 *by* Felhampton Cautious 13947.

1423 III., £10.—Miss E. Martin Smith, Grange Court, Portington, Howden, for **Donaldfield Margaret 2nd 115248**, born Jan. 22, 1927, calved May 24, 1933, bred by Robert Holmes, Donaldfield Farm, Bridge of Weir, Renfrewshire ; *s.* Loiston Samuel 23557, *d.* Donaldfield Margaret 81088 *by* Golf Monarch 9771.

1416 IV., £4.—Frank William Gilbert, The Manor, Chellaston, Derby, for **Winterbourne Dotterel 2nd 111610**, born Oct. 29, 1926, calved Jan. 16, 1933, bred by T. Mansfield, Winterbourne Court, Glos. ; *s.* Commieston Bromley Ceres 22879 P.I., *d.* Eastern Dotterell 24346 *by* Monkton Answer 1773.

1415 V., £3.—George Gee, Ely Grange, Frant, Tunbridge Wells, for **Herrington Hyphen 117230**, born July 8, 1927, calved May 26, 1933, bred by Albert Weightman, Middle Herrington, Sunderland ; *s.* Herrington Ynte's Editor 26037, *d.* Masham Series Daisy 84868 *by* Hedges Second Series 6427 P.I.

1424 R.N.—Strutt & Parker (Farms), Ltd., The Bury, Hatfield Peverel, Chelmsford, for **Lavenham Jess 2nd.**

H.C.—1425. C.—1420.

1426, 1440, 1458 Cup.[2]—J. R. Upson, for **Moulsoe Elsie 2nd, Saracens Nancy** and **Saracens Effie 2nd.**

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[1] Prizes, except Fourth and Fifth, given by the British Friesian Cattle Society.

[2] Silver Challenge Cup given through the British Friesian Cattle Society for the best group of three Cows or Heifers.

[3] Champion Prize of £10 given by the British Friesian Cattle Society for the best Cow or Heifer.

Class 169.—*British Friesian Cows, in-milk, born in* 1928 *or* 1929, *having yielded a minimum of* 6,500 *lb. of milk during a lactation period of* 315 *days.*[1]

1433 I., £20.—Lord Rayleigh, The Bury, Hatfield Peverel, Chelmsford, for **Terling Breeze 34th** 141922, born Feb. 21, 1929, calved April 30, 1933; *s.* Terling Collona's Lad 30001 P.I., *d.* Terling Breeze 22nd 99208 *by* Terling (imp. 1922) Marthus 21533.

1430 II., £15.—Frank William Gilbert, The Manor, Chellaston, Derby, for **Killis Queen Belle** 138302, born Nov. 29, 1929, calved June 13, 1933, bred by Matthew S. Langton, Killis Farm, Kilburn, Derbyshire; *s.* Chellaston Burinze 30685, *d.* Killis Queenie 95126 *by* Westonhall Albert 27373.

1427 III., £10.—E. G. Barton, Saundby, Retford, Notts., for **Combermere Eleanor 2nd** 125220, born Nov. 6, 1928, calved June 3, 1933, bred by Sir Kenneth I. Crossley, Bart., Combermere Abbey, Whitchurch; *s.* Hache Capable 28693, *d.* Combermere Eleanor 91476 *by* Northdean Bram Bertus 14981.

1429 R.N.—Frank William Gilbert, for **Hughlea Akrin's Nancy.**

Class 170.—*British Friesian Heifers, in-milk to first calving, born on or after January* 1, 1930.[1]

1440 I.—J. R. Upson, Rush Court, Wallingford, for **Saracens Nancy** 150968, born March 22, 1930, calved June 2, 1933; *s.* Saracens Meibloem Beatty 33449 P.I., *d.* Charndon Nancy 102624 *by* Crawford (imp. 1922) Beatty 6th 19689.

1436 II.—Capt. John Christie, M.C., Goat Farm, Ringmer, Lewes, for **Glyndebourne Piper 4th** 146992, born May 18, 1930, calved May 17, 1933; *s.* Glyndebourne Buscon 34279, *d.* Glyndebourne Piper 2nd 116538 *by* Glyndebourne (imp. 1922) Rikus 20111.

1438 III.—Frank William Gilbert, The Manor, Chellaston, Derby, for **Saundby Mabel** 161182, born Feb. 20, 1931, calved June 17, 1933, bred by E. G. Barton, Saundby, Retford, Notts.; *s.* Chaddesley Roseprince 25175, *d.* Chaddesley May 79966 *by* Chaddesley Comrade 13497.

1435 R.N.—Capt. John Christie, M.C., for **Glyndebourne Elsie 4th.**

H.C.—1437.

Class 171.—*British Friesian Heifers, born on or between January* 1 *and June* 30, 1931.

1444 I.—George Gee, Ely Grange, Frant, Tunbridge Wells, for **Mayford Mars Hyphen** 159262, born June 28; *s.* Douneside Marcellus 34163, *d.* Herrington Hyphen 117230 *by* Herrington Ynte's Editor 26037.

1448 II.—The Trustees of Sir A. W. MacRobert, Bart., Douneside, Home Farm, Tarland, Aberdeenshire, for **Douneside Lala 2nd** 155742, born April 1; *s.* Douneside Masterpiece 19835, *d.* Douneside Lala 126014 *by* Douneside Pel Klaas 30901.

1447 III.—The Trustees of Sir A. W. MacRobert, Bart., for **Douneside Bertus Minna 4th** 155736, born June 9; *s.* Douneside Masterpiece 19835, *d.* Colney Bertus Minna 51558 *by* Terling (imp.) Vic Bertus 4541.

1445 R.N.—Frank William Gilbert, The Manor, Chellaston, Derby, for **Abingworth Grace.**

H.C.—1442, 1443. C.—1441.

Class 172.—*British Friesian Heifers, born on or between July* 1 *and December* 31, 1931.

1455 I.—Bertram Parkinson, Creskeld Hall, Arthington, Leeds, for **Creskeld Lotus 10th** 155262, born July 1; *s.* Creskeld Knierke Beatty 35565 P.I., *d.* Creskeld Lotus 5th 125570 *by* Northdean Meibloem's Beatty 26679 P.I.

1458 II.—J. R. Upson, Rush Court, Wallingford, for **Saracens Effie 2nd** 161124, born Aug. 5; *s.* Saracens Captain 36467, *d.* Hemsted Effie 62446 *by* Kingswood Sir Kalma 8139.

1453 III.—The Trustees of Sir A. W. MacRobert, Bart., Douneside Home Farm, Tarland, Aberdeenshire, for **Douneside Beatrice 2nd** 155732, born Nov. 7; *s.* Douneside Masterpiece 19835, *d.* Douneside Beryl 2nd 103990 *by* Hache Apollo 22925 P.I.

1452 R.N.—Arthur James Hill, Denton Park, Ben Rhydding, Yorks., for **Ahill Vixen.**

H.C.—1456. C.—1450, 1451, 1457.

Class 173.—*British Friesian Heifers, born on or between January* 1 *and June* 30, 1932.[1]

1463 I.—Frank William Gilbert, The Manor, Chellaston, Derby, for **Harperadams Honesty 3rd** 168014, born March 14, bred by Harper Adams Agricultural College, Newport, Shropshire; *s.* Holyport Yneseries 31221 P.I., *d.* Terling Honesty 76768 *by* Dunninald Haeayemairschaap 7699 P.I.

1475 II.—G. B. Radcliffe, Pool Bank, Tarvin, Chester, for **Tarvin Wilful** 172860, born May 4; *s.* Tarvin Janke's Mairschaap 33525, *d.* Tarvin Pearl 110594 P.I. *by* Tarvin (imp. 1922) Mazeppa 21507.

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[1] Prizes, except Fourth and Fifth, given by the British Friesian Cattle Society.

1479 III.—J. R. Upson, Rush Court, Wallingford, for **Saracens Poppy** 171994 P.I., born Feb. 19; *s.* Saracens Meibloems Beatty 83449 P.I., *d.* Henbury Pretty Polly 105860 P.I. *by* Wychnor Frits 7215 P.I.

1476 IV.—G. B. Radcliffe, for **Tarvin Winifred** 172874, born Jan. 14; *s.* Tarvin Janke's Mairschaap 83525 P.I., *d.* Tarvin Queechy 121702 *by* Mapleton Hilko's Ironclad 26511 P.I.

1470 V.—The Trustees of Sir A. W. MacRobert, Bart., Douneside Home Farm, Tarland, Aberdeenshire, for **Douneside Lala 3rd** 166458, born May 27; *s.* Douneside Masterpiece 19835, *d.* Douneside Lala 126014 *by* Douneside Pel Klaas 30901 P.I.

1477 R.N.—Mrs. Graham Rees-Mogg, Clifford Manor, Stratford-on-Avon, for **Clifford Chambers Ione.**

H.C.—1462, 1474. C.—1471, 1478.

Class 174.—*British Friesian Heifers, born on or between July* 1 *and December* 31, 1932.[1]

1488 I.—James Kilpatrick, Craigie Mains, Kilmarnock, for **Craigiemains Lady Bounty 2nd** 165792, born Aug. 3; *s.* Hache Felix 34323 P.I., *d.* Craigiemains Beauty 2nd 114608 *by* Castlestuart Arthur 22271.

1485 II.—W. H. R. Gilbert, The Cottage, Aston Flamville, Hinckley, for **Astonville Beatrice 5th** 163336, born Aug. 14; *s.* Astonville Duke 32199, *d.* Wychnor Bluebell 3rd 67736 *by* Wychnor Frits 7215 P.I.

1484 III.—The Trustees of Ethelbert Furness, Hamels Park, Buntingford, for **Hamels Osprey** 167900, born Aug. 18, bred by the late E. Furness; *s.* Hamels Lusty Lad 35881, *d.* Hamels Kudos 127576 *by* Glyndebourne Achilles 31043 P.I.

1489 IV.—The Trustees of Sir A. W. MacRobert, Bart., Douneside Home Farm, Tarland, Aberdeenshire, for **Douneside Sheila 2nd** 166478, born Aug. 22; *s.* Douneside Masterpiece 19835, *d.* Douneside Pel Sloe 4th 126030 *by* Lochlands Hollander 29235 P.I.

1483 R.N.—The Trustees of Ethelbert Furness, for **Hamels Omen.**

H.C.—1481. C.—1482, 1487, 1490.

Ayrshires.

Class 175.—*Ayrshire Bulls, born before September* 1, 1931.

1492 I.—Adam W. Montgomerie, Westburn Farm, Cambuslang, for **Bargenoch Blue Ribbon** 31923, born Nov. 14, 1929, bred by John Logan, Bargenoch, Drongan; *s.* Mossgiel Encore 27500, *d.* Bargenoch Theresa 12090 *by* Lowmilton Archer 23019.

1493 II.—National Society for Epileptics, Chalfont Colony, Gerrards Cross, for **Valleyfield Favourite** 31168, born Jan. 9, 1931, bred by John Forsyth, Valleyfield, Stranraer; *s.* Sandhill Milk Boy 26427, *d.* Valleyfield Brownie 5th 2709 *by* Hobsland Lucks All 21138.

1491 III.—E. Greenshields, Ivy House, East Herrington, Sunderland, for **Catlins Barquantine** 30476, born Jan. 4, 1929, bred by M. Cochrane, Catlins, Lockerbie; *s.* Catlins Felix 28676, *d.* Ryemuir Judy 3rd 76940 *by* Netherhall Reserve 17508.

Class 176.—*Ayrshire Bulls, born on or after September* 1, 1931.

1494 I.—E. Greenshields, Ivy House, East Herrington, Sunderland, for **Laigh Tarbeg Night Patrol,** born Jan. 10, 1932, bred by G. Connell, Laigh Tarbeg, Ochiltree; *s.* Laigh Tarbeg Lucky Star 30057, *d.* Laigh Tarbeg Dark Girl 2nd 22139 *by* Lessnessock Farmer 26334.

1497 II.—James Howie, Junr., Eglinton Mains, Irvine, Ayrshire, for **Hobsland Grand Master** 32037, born Nov. 4, 1931, bred by Thomas Barr, Hobsland, Monkton; *s.* Netherhall Enterprise 27359, *d.* Hobsland Miss Gray 3rd 16589 *by* Hobsland Finalist 25219.

1501 III.—Adam W. Montgomerie, Westburn Farm, Cambuslang, for **Low Milton Knave** 32360, born Oct. 17, bred by Thomas Logan, Low Milton, Maybole; *s.* Southcraig Golden Coin 29189, *d.* Low Milton Highland Mary 27426 *by* Meadowbank Brown Bobby 26816.

1498 R.N.—James Howie & Sons, Muirside, Dumfries, for **Eastertown Classic.**

Class 177a.—*Ayrshire Cows, in-milk, born on or before September* 1, 1930.

1511 I. & R.N. for Champion.[2]—Eshott Pedigree Stock Farms, Eshott, Felton, Northumberland, for **Auchenbrain Miss Craig 34th** 98389, born March 9, 1924, calved May 24, 1933, bred by D. Wallace, Auchenbrain, Mauchline; *s.* South Craig Footprint 19958, *d.* Auchenbrain Miss Craig 12th 57345 *by* Lessnessock Kerenski 16026.

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[1] Prizes, except Fourth, given by the British Friesian Cattle Society.

[2] The "Oldner" Silver Challenge Cup given through the Ayrshire Cattle Herd Book Society for the best Cow or Heifer.

1518 II.—D. Mackay, Symonds Hydes, Hatfield, for **Blackbyres Princess 3rd 26930**, born April 24, 1929, due to calve before the Show, bred by A. & J. Marr, Blackbyres, Maybole; *s.* Muirlaught Prince 26958, *d.* Blackbyres Princess 2nd 7061 *by* Blackbyres Bobby 23305.

1525 III.—Robert Sillars & Son, Ickham Court, Canterbury, for **Ickham Carol 10632**, born May 18, 1926, calved June 17, 1933; *s.* Westburn Cupbearer 22197, *d.* Netherton Carol 3rd A. 7315 *by* Netherton Dayspring 13814.

1508 R.N.—Alexander Cochrane, Nether Craig, Kilmarnock, for **Auchenbainzee Margaret 2nd.**

H.C.—1527.

Class 177b.—*Ayrshire Cows, in-calf, born on or before September* 1, 1930.

1526 I., Champion[1] & Champion.[2]—Robert Sillars & Son, Ickham Court, Canterbury, for **Ickham Dolly 10634**, born Nov. 22, 1924; *s.* Chapmanton MacAndrew 18549, *d.* Edingham Tony 2nd 82964 *by* Sand Hill Tempest 17480.

1519 II. & R.N. for Champion.[2]—D. Mackay, Symonds Hydes, Hatfield, for **Cauldhame Wallflower 3rd 2127**, born Dec. 11, 1924, bred by John Craig, Cauldhame, Dunlop; *s.* Netherton Balderstone 18379, *d.* Cauldhame Wallflower 72896 *by* Cauldhame Rising Sun 14887.

1513 III.—Eshott Pedigree Stock Farms, Eshott, Felton, Northumberland, for **Eshott Princess 10704**, born March 9, 1926; *s.* Howie's Eminent 16978, *d.* Mainhill Princess 7th 84900 *by* Millantae Perfection 17876.

1520 R.N.—D. Mackay, for **Mid Ascog Gaiety 3rd.**

H.C.—1517.

Class 178a.—*Ayrshire Heifers, in-milk, born after September* 1, 1930, *and before September* 1, 1931.[3]

1532 I.—H. J. Clark, Oldner House, Chipping Norton, for **Oldner Wallflower 36655**, born Nov. 2, 1930, calved April 24, 1933; *s.* Carnell Specialist 26471, *d.* Cauldhame Wallflower 2nd 85471 *by* Netherton Balderstone 18379.

1534 II.—Robert Dickie, Knockenjig, Sanquhar, Dumfriesshire, for **Knockenjig Erica 37662**, born Nov. 6, 1930, calved June 18, 1933; *s.* Lessnessock Scarlet Orb 27724, *d.* Knockenjig Camelia 20842 *by* Relief Banker 23874.

1535 III.—Eshott Pedigree Stock Farms, Eshott, Felton, Northumberland, for **Eshott Vain Beauty 40024**, born Oct. 27, 1930, calved June 26, 1933; *s.* Misarden Vanity 29665, *d.* Eshott Beauteous 18227 *by* Douglas Hall Speculation 18566.

1543 R.N.—Robert Sillars & Sons, Ickham Court, Canterbury, for **Ickham Marjory 3rd.**

Class 178b.—*Ayrshire Heifers, in-calf, born after September* 1, 1930, *and before September* 1, 1931.[3]

1536 I.—James Howie & Sons, Muirside, Dumfries, for **Howie's Iris 41047**, born Sept. 15, 1930; *s.* Howie's Defiance 28424, *d.* Dalzell Plumb Centre 19229 *by* Westburn Marksman 26545.

1539 II.—National Society for Epileptics, Chalfont Colony, Gerrards Cross, for **Chalfont Fun 2nd 39607**, born Sept. 26, 1930; *s.* Craigraploch Crusader 27683, *d.* Eglinton Fun 7096 *by* Eglinton Mains Snow King 19734.

1538 III.—Adam W. Montgomerie, Westburn Farm, Cambuslang, for **Drongan Mains Rosabelle 39895**, born Nov. 14, 1930, bred by Messrs. Mackie, Drongan Mains, Drongan; *s.* Southcraig Specialist 28155, *d.* Drongan Mains Valerie 17220 *by* Southcraig Special 26327.

1528 R.N.—Thomas Barr, Hobsland, Monkton, for **Hobsland Janet 6th.**

Class 179.—*Ayrshire Heifers, born on or after September* 1, 1931.

1554 I.—James Howie & Sons, Muirside, Dumfries, for **Howie's Iris 2nd 44133**, born Oct. 3, 1931; *s.* Howie's Orange Pip 29892, *d.* Dalzell Plumb Centre 19229 *by* Westburn Marksman 26545.

1556 II.—National Society for Epileptics, Chalfont Colony, Gerrards Cross, for **Chalfont Buttercup 43277**, born Oct. 24, 1931; *s.* Auchenbrain Brutus 20913, *d.* Seckford Buttercup 17416 *by* Rigg Jupiter 19483.

1546 III.—Thomas Barr, Hobsland, Monkton, for **Hobsland Nancy 27th 43017**, born Jan. 1, 1932; *s.* Howie's Investment 28427, *d.* Hobsland Nancy 13th 95047 *by* Hobsland Lucky Boy 16482.

1553 R.N.—James Howie & Sons, for **Howie's Blossom 7th.**

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[1] The "Oldner" Silver Challenge Cup given through the Ayrshire Cattle Herd Book Society for the best Cow or Heifer.

[2] The "Cowhill" Silver Challenge Cup given through the Ayrshire Cattle Herd Book Society for the best Ayrshire.

[3] Prizes given by the Ayrshire Cattle Herd Book Society.

Guernseys.

N.B.—Unless otherwise stated the numbers refer to the English Guernsey Herd Book.

Class 180.—*Guernsey Bulls, born in or before* 1930.

1561 I., Champion[1] & Champion.[2]—Edward Gerrish, Carrallack House, St. Just, Cornwall, for **Valerie's Honour** 9008, fawn and white, born Nov. 8, 1925, bred by W. B. Langlois, Les Caches, St. Peter's-in-the-Wood, Guernsey; *s.* Lady's Honour 4883 P.S., *d.* 19187 P.S. Valerie of Caches Farm *by* Polly's Governor des Ruettes 3906 P.S.

1563 II., R.N. for Champion[1] & R.N. for Champion.[2]—Eric H. Rose, Leweston Manor, Sherborne, Dorset, for **Leweston Rose Lad** 7790, fawn and white, born April 29, 1929; *s.* Fernhill Rose Lad 2nd 6799, *d.* 16953 Rosey of Goodnestone 11th *by* Slogan de Bon Espoir 4317.

1560 III.—W. Dunkels, Fernhill Park, Windsor Forest, for **Fernhill Robert 5th** 7795, fawn and white, born April 28, 1929; *s.* Hindhead Robert 6th 5847, *d.* 14281 Downe Fleur de Vimiera *by* Valentine's Honour of the Passée 3826.

1559 R.N.—Capt. Cosmo Douglas, Hazelby, Newbury, for **Medora's Boy.**

H.C.—1566. C.—1562.

Class 181.—*Guernsey Bulls, born in* 1931.

1576 I.—Mrs. Evelyn Rich, Wretham Hall, Thetford, Norfolk, for **Silverstead Lord Roberts** 9056, fawn and white, born July 20; *s.* Lord Roberts 9th of Rusper 7649, *d.* 30949 Silverstead Polly *by* Shiwa Wintergreen's Lad 6369.

1572 II.—H. A. Y. Dyson, Dalton, Bolney, Sussex, for **Noel of Chute** 8903, fawn and white, born March 10, bred by W. A. Addinsell, Chute Lodge, Wiltshire; *s.* Noel of Goodnestone 7287, *d.* 24206 Bitterne Mollie *by* Bitterne Emperor 5011.

1577 III.—H. B. Turner, Malverleys, Newbury, for **Bladen Rose Lad 8th** 9111, fawn and white, born Aug. 13, bred by Sir Ernest Debenham, Bladen Farms, Dorchester; *s.* Milton Rose Lad 7830, *d.* 15970 Violet of Goodnestone 8th *by* Favourite 2nd of the Barras 3516.

1574 R.N.—Sir Gordon Ley, Bart., Furze Down, King's Somborne, Hants., for **Furze Down Rose Lad 3rd.**

H.C.—1573. C.—1570.

Class 182.—*Guernsey Bulls, born in* 1932.

1590 I.—H. B. Turner, Malverleys, Newbury, for **Malverleys Rose Lad 2nd** 9608, fawn, born July 9; *s.* May Rose Cherub of the Spurs 7729, *d.* 29391 Doreen of Duvallerie *by* Emblem of Duvallerie 4892 P.S.

1581 II.—H. A. Y. Dyson, Dalton, Bolney, Sussex, for **Coqueta's Galaxy of Payhay** 9795, fawn and white, born May 20; *s.* Clara's Valour of King's Mills 8655, *d.* 35469 La Coqueta of La Hougue *by* La Fleur du Jardin's Leader 5516 P.S.

1580 III.—Capt. Cosmo Douglas, Hazelby, Newbury, for **De Baugy's Aileen's Rajah** 9744, fawn, born Feb. 7, bred by M. de Baugy, Le Vallon, St. Martin's, Guernsey; *s.* Rex of the Grove 5528 P.S., *d.* 26474 P.S. De Baugy's Aileen *by* May Rose Lad of the Spurs 6158.

1587 IV.—Eric H. Rose, Leweston Manor, Sherborne, Dorset, for **Leweston Golden Tip 4th** 9927, fawn and white, born July 30; *s.* Golden Tip's Sequel 2nd 8168, *d.* 27207 Leweston Citron *by* Elfordleigh Hammill 4185.

1586 V.—Mrs. J. Sutcliffe Pyman, Norsebury, Sutton Scotney, Hants., for **Norsebury Lodestar 17th** 9524, fawn and white, born April 27; *s.* Sequel's Lodestar 2nd 4932, *d.* 12843 Rosey of Goodnestone *by* Gunner 3rd 2459.

1589 R.N.—W. G. Trower, Stanstead bury, Ware, Herts., for **Cheerful Charlie of Stanstead.**

H.C.—1578, 1588. C.—1591.

Class 183.—*Guernsey Cows, in-milk, born in or before* 1928.

1601 I., Champion[3] & Champion.[4]—Mrs. J. Sutcliffe Pyman, Norsebury, Sutton Scotney, Hants., for 25809 **Rosey of Goodnestone 33rd,** fawn and white, born Feb. 8, 1927, calved June 9, 1933, bred by Lord FitzWalter, Goodnestone Park, Canterbury; *s.* Clara's Lad of King's Mills 6020, *d.* 20248 Rosey of Goodnestone 22nd *by* Sequel's Slogan 2nd 4811.

1602 II., R.N. for Champion[3] & R.N. for Champion.[4]—Mrs. J. Sutcliffe Pyman, for 26972 **Sequel's May Belle 4th,** fawn and white, born July 6, 1927, calved May 22, 1933, bred by Mrs. A. Le Patourel, La Ramée, St. Peter Port, Guernsey; *s.* Galaxy's Slogan 8405, *d.* 16132 P.S. Sequel's May Belle *by* Honória's Sequel 2nd 2816 P.S.

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[1] Champion Prize of £5 given by the English Guernsey Cattle Society for the best Bull.

[2] The "Calehill" Silver Challenge Cup given by the English Guernsey Cattle Society for the best Bull.

[3] Champion Prize of £5 given by the English Guernsey Cattle Society for the best Cow or Heifer.

[4] The "Fernhill" Silver Challenge Cup given by the English Guernsey Cattle Society for the best Cow or Heifer.

1592 III.—Capt. Cosmo Douglas, Hazelby, Newbury, for **Hazelby Sunshine 27826**, fawn and white, born Feb. 17, 1928, calved May 14, 1933; *s.* Hindhead Robert 4th 5488, *d.* 23213 Poltimore Ursula 2nd *by* Pengelly Boy's Sequel 4893.

1595 R.N.—Esmond D. Fairweather, The Manor House, Waltham St. Lawrence, Berks., for **May Boy Daisy of the Blanche.**

Class 184.—*Guernsey Cows or Heifers, in-milk, born in* 1929 *or* 1930.[1]

1614 I.—Mrs. Howard Palmer, Heathlands, Wokingham, for **33320 Murrell Diadem**, fawn and white, born May 4, 1930, calved May 12, 1933; *s.* Murrell Rose Lad 7194, *d.* 24057 Murrell Damby *by* Nelly's Fancy 4886.

1613 II.—Mrs. Howard Palmer, for **33777 Clara's Fashion 2nd of Rusper**, fawn and white, born June 16, 1930, calved June 4, 1933, bred by W. A. Argent, Ghyll Manor, Rusper; *s.* Wintergreen's Sequel of Rusper 7143, *d.* 29578 Clara's Fashion 3rd *by* Rex of Maple Lodge 6448.

1609 III.—Capt. Cosmo Douglas, Hazelby, Newbury, for **30788 Hazelby New Year's Joy**, fawn and white, born April 17, 1929, calved June 16, 1933; *s.* Clatford Rosie's Sequel of Vimiera 3873, *d.* 23766 Ladock New Year's Gift *by* Rival of Myrtle Place 5219.

1619 IV.—W. G. Trower, Stansteadbury, Ware, Herts., for **30336 Stanstead Rose 59th**, fawn and white, born Feb. 14, 1929, calved May 27, 1933; *s.* Prince of the Hamlet 6193, *d.* 24435 Stanstead Rose 48th *by* Son of President Vimiera 5128.

1618 R.N.—Lord Swaythling, Townhill Park, West End, Southampton, for **Dorina of the Valinguet.**

H.C.—1615. **C.**—1612.

Class 185.—*Guernsey Heifers, born in* 1931.

620 I.—W. Dunkels, Fernhill Park, Windsor Forest, for **36338 Fernhill Victorine 7th**, fawn and white, born June 1; *s.* Lavender's Slogan of La Hougue 7839, *d.* 30862 Fernhill Victorine 6th *by* Hindhead Robert 6th 5847.

Class 186.—*Guernsey Heifers, born in* 1932.

1625 I.—W. Dunkels, Fernhill Park, Windsor Forest, for **38921 Fernhill Primrose 6th**, fawn and white, born May 16; *s.* Lavender's Slogan of La Hougue 7839, *d.* 30751 Fernhill Primrose 5th *by* Hindhead Robert 6th 5847.

1631 II.—Carl Holmes, Clover Top Farm, Codicote, Hitchin, for **38484 Rosey of Goodnestone 62nd**, fawn and white, born Feb. 1, bred by Lord FitzWalter, Goodnestone Park, Canterbury; *s.* Rosey's Slogan 3rd of Goodnestone 7774, *d.* 31844 Rosey of Goodnestone 49th *by* Honoria's Advocate 5286.

1639 III.—H. B. Turner, Malverleys, Newbury, for **39368 Malverley's Daffodil 2nd**, fawn and white, born July 2; *s.* Malverley's King Fancy 8324, *d.* 32104 Malverley's Daffodil *by* Tregothnan Farmer 6243.

1635 IV.—Capt. Harold J. Pilbrow, Mapleton, Edenbridge, for **38651 Mapleton June Violet 2nd**, fawn and white, born March 25; *s.* Gaddesden Rosey's Sequel 7988, *d.* 31029 Mapleton June Violet *by* Monarch of Friquet de Haut 6870.

1636 R.N.—Mrs. J. Sutcliffe Pyman, Norsebury, Sutton Scotney, Hants., for **Rosey 8th of Rusper.**

Jerseys.

N.B.—In the Jersey Classes, the number inserted within brackets after the name of an animal indicates the number of such animal in the Island Herd Book. A number without brackets indicates that the animal is registered in the English Jersey Herd Book.

Class 187.—*Jersey Bulls, born in or before* 1930.

1645 I. & Champion.[2]—Brig.-Gen. F. C. More-Molyneux, C.M.G., D.S.O., Loseley Park, Guildford, for **Lingen Sweet Time 15528**, whole colour, born June 9, 1924, bred by Col. L. G. Gisborne, Spains Hall, Essex; *s.* The Sweep 14144, *d.* Thyme *by* Lucy's Gem 18342.

1644 II & R.N. for Champion.[2]—Sir Harold Mackintosh, Conyngham Hall, Knaresborough, for **Joubert 16587**, whole colour, born May 27, 1928, bred by Lady Estella Hope, South Park, Bodiham; *s.* Purple Emperor 16066, *d.* 643 Jolie *by* Eocleaden Peter 13556.

1648 III.—Cortlandt Taylor, Platt House Farm, Wrotham, Kent, for **Fairseat Majesty 17145**, whole colour, born Aug. 20, 1930; *s.* Fairseat Majesty 16720, *d.* Demure Princess *by* Broadlands Son 12858.

1642 R.N.—James J. Hoyle, Chase Cottage Farm, Potters Bar, for **Combina's Dreamer.**

H.C.—1643. **C.**—1641.

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[1] Prizes, except Fourth, given by the English Guernsey Cattle Society.

[2] Champion Prize of £5 given by the English Jersey Cattle Society for the best Bull.

Class 188.—*Jersey Bulls, born in* 1931.

1656 **I.**—Haydon Stephen-Fox, Sharelands, Blackboys, Sussex, for **Sharelands Pioneer Noble** 17378, broken colour, born Jan. 18; *s.* Cowdray Pioneer 11th 16254, *d.* 3859 Pearcelands Ivy *by* Young Masterstroke 14516.

1658 **II.**—Mrs. J. T. Wigan, Danbury Park, Chelmsford, for **Cocktail** 17488, broken colour, born July 10, bred by E. J. Laurens, St. Marys, Jersey; *s.* Dreaming Bob 16436, *d.* (30361) Ediswan *by* The Sweep 14144.

1651 **III.**—Capt. E. L. Hughes, R.N., Spring Hill, Capel, Ipswich, for **Jutland** 17226, whole colour, born April 12; *s.* Joubert 16587, *d.* 9784 Mischief *by* Black Diamond 14945.

1650 **R.N.**—Mrs. Henry Hawkins, Everdon Hall, Daventry, for **Spetchley Jeweller.**
H.C.—1657. **C.**—1652.

Class 189.—*Jersey Bulls, born in* 1932.

1668 **I. & Champion.**[1]—Brig.-Gen. F. C. More-Molyneux, C.M.G., D.S.O., Loseley Park, Guildford, for **Wotton Oasis** 17975, whole colour, born Jan. 10, bred by Mrs. Evelyn, Wotton House, Dorking; *s.* Wotton Sandpole 16786, *d.* 11846 Wotton Haze *by* Wotton Airman 2nd 14502.

1661 **II.**—Sir Harry Hague, 184, Queen's Gate, London, S.W.7, for **Ovaltine Oxfordia's Lad** 17850, broken colour, born July 5, bred by A. Wander, Ltd.; *s.* Oxfordia's Lad 16351, *d.* 18502 Le Hocq Mighty Lily *by* The Mighty Owl 15450.

1662 **III. & R.N. for Champion.**[1]—H. B. Hart, Pinehurst, Harston, Cambs., for **Majesty's Sweep Time** 17804, whole colour, born May 21; *s.* Majestic Prince 16907, *d.* 8618 Sweep's Thyme *by* Lingen Sweep Time 15523.

1659 **IV.**—Mrs. G. J. Austin, Ellern Mede, Totteridge, Herts., for **Liberty** 17787, whole colour, born May 4; *s.* Unabashed 17574, *d.* 13673 Lunuva *by* Majestic 15885.

1671 **V.**—William E. Press, Wolvers, Reigate, for **Wolvers Rufus** 17968, whole colour, born May 14; *s.* Hook Cæsar 17198, *d.* 9717 Margawse *by* Palatine's Observer 15400.

1664 **R.N.**—James J. Hoyle, Chase Cottage Farm, Potters Bar, for **Combina's Gamboge.**
H.C.—1663, 1675

Class 190.—*Jersey Cows, in-milk, born in or before* 1929.

1701 **I. & Champion.**[2]—H. Cecil Pelly, Venars, Nutfield, Surrey, for 8977 **Campeia's Gift,** whole colour, born April 17, 1927, calved June 9, 1933, bred by P. Le Brocq, St. Ouen, Jersey; *s.* Bull's Eye 14557, *d.* 6067 Campeia *by* Dreaming Sultan 14600.

1691 **II. & R.N. for Champion.**[2]—Sir John B. Lloyd, Foxbury, Stone Sweet, Sevenoaks, for 9414 **Hamletta's Mistress,** whole colour, born March 24, 1927, calved May 3, 1933, bred by A. W. Ruggles Brise, Spains Hall, Braintree; *s.* Lingen Sweep Time 15523, *d.* Hamletta 5th *by* Combination 2nd 11644.

1683 **III.**—Sir Harry Hague, 184, Queen's Gate, London, S.W.7, for **Eucalia's Jest,** whole colour, born July 20, 1929, calved May 12, 1933, bred by J. Le Breuilly, Senr., Trinity, Jersey; *s* Royal Jester 16648, *d.* (31062) Gay Eucalia *by* Gay Mack 14861.

1697 **IV.**—John Pierpont Morgan, Wall Hall, Watford, for 7945 **Happy Midsummer Dream,** broken fawn, born June 25, 1924, calved May 18, 1933, bred by W. C. Gruchy, Trinity, Jersey; *s.* Bindle 14943, *d.* (30633) Happy Princess *by* Blonde's Golden Oxford 12554.

1698 **V.**—Sir Harold Mackintosh, Conyngham Hall, Knaresborough, for 18459 **Highstead Friendship,** whole colour, born Aug. 19, 1928, calved May 28, 1933, bred by F. P. Ozouf, Jersey; *s.* Tapon's Friend 18086, *d.* (30835) Little Gem Rose *by* Margaret's Gamboge 14868.

1684 **R.N.**—Sir Harry Hague, for **Playmate of Oaklands.**
H.C.—1679, 1686, 1687, 1692, 1700, 1702. **C.**—1681, 1704.

1692 **Special II.**[3]—Sir John B. Lloyd, for **Valentine's Countess.**

Class 191.—*Jersey Heifers, in-milk, born in* 1930.

1712 **I.**—Sir Harry Hague, 184, Queen's Gate, London, S.W.7, for 18575 **Primrose Mercedes,** whole colour, born Feb. 9, calved June 1, 1933, bred by F. Le Clevex, St. Johns, Jersey; *s.* Bravo 15834, *d.* (33545) Stylish Mercedes *by* Charlie 15945.

1709 **II. & R.N. for Specials.**[3]—Mrs. G. J. Austin, Ellern Mede, Totteridge, Herts., for 14116 **Patience,** broken colour, born April 9, calved April 8, 1933; *s.* Majestic 15885, *d.* 9908 Pamela *by* Rapallo 15545.

1718 **III.**—John Pierpont Morgan, Wall Hall, Watford, for 11902 **Aldenham Nora 3rd,** broken fawn, born April 2, calved May 26, 1933; *s.* Aldenham General Cowslip 15481, *d.* 6840 Nona *by* Lily Light's Oxford 15047 A.

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[1] The "Meridale" Perpetual Silver Challenge Cup given through the English Jersey Cattle Society for the best yearling Bull from recorded dam.

[2] Champion Prize of £5 given by the English Jersey Cattle Society for the best Cow or Heifer.

[3] Special Prize of £10 (First Prize) and £5 (Second Prize) given by the English Jersey Cattle Society for the best Cows or Heifers in Classes 190 to 193, bred by Exhibitor, and milked out to the Judge's satisfaction before being judged.

1708 IV.—Mrs. G. J. Austin, for 13673 **Lunuva**, whole colour, born March 30, calved April 26, 1933, *s.* Majestic 15885, *d.* 6631 Levandra *by* Saint Louis 14778.

1714 V.—Mrs. Henry Hawkins, Everdon Hall, Daventry, for 18445 **Gentle Dream's Fancy**, whole colour, born March 5, calved April 21, 1933, bred by J. S. Bisson, Jersey; *s.* Dreaming Bob 16436, *d.* (32883) Gentle Xenia 2nd *by* Roumanian 15763.

1715 R.N.—Mrs. Henry Hawkins, for **Rusma's Judy**.

H.C.—1722. **C.**—1719, 1721, 1725, 1726, 1727.

Class 192.—*Jersey Heifers, in-milk, born in* 1931.[1]

1729 I. & Special I.[2]—Mrs. Evelyn, Wotton House, Dorking, for 15072 **Wotton H.M.S. Elizabeth**, whole colour, born June 4, calved June 20, 1933; *s.* Wotton Airman 2nd 14502, *d.* 10252 War Betty *by* Charm of War 15279.

1740 II.—Frances Countess of Warwick, Easton Lodge, Dunmow, Essex, for 18537 **Miss Dreaming Lady**, whole colour, born Feb. 18, calved May 25, 1933, bred by C. F. Ménard, St. Brelade, Jersey; *s.* Dreaming Bob 16436, *d.* (32820) Miss Farewell Lady *by* Cowslip's Farewell 18004.

1739 III.—Robert Gould Shaw, Platt House Farm, Wrotham, Kent, for 13459 **Kentwins Heatha**, broken colour, born May 17, calved April 28, 1933, bred by H. Cecil Pelly, Venars, Nutfield, Surrey; *s.* Kentwins Poppy's Aroma 16453, *d.* 11091 Kentwins Anchusa *by* Beau des Noyers, 15925.

1736 IV.—H. Cecil Pelly, Venars, Nutfield, Surrey, for **Butter Primrose**, whole colour, born March 18, calved May 1, 1933, bred by J. P. Le Brocq, St. Peter, Jersey; *s.* Dreaming Pioneer 16714, *d.* (30305) Butter Rosette *by* Xenia's Sultan 2nd 14511.

1728 R.N.—Mrs. G. J. Austin, Ellern Mede, Totteridge, Herts., for **Laurel**.

H.C.—1732. **C.**—1735, 1742.

Class 193.—*Jersey Heifers, born in* 1932.

1754 I.—H. Cecil Pelly, Venars, Nutfield, Surrey, for 16855 **Kentwins Joselda**, broken colour, born May 23; *s.* Monk's Green Recruit 16922, *d.* 13463 Kentwins Josea *by* Beau des Moyers 15925.

1745 II.—Sir Harry Hague, 184, Queen's Gate, London, S.W.7, for 17399 **Ovaltine Primrose**, whole colour, born June 9, bred by A. Wander, Ltd.; *s.* Mighty Pioneer 18049, *d.* 18575 Primrose Mercedes *by* Bravo 15834.

1747 III.—Lady Violet Henderson, Buscot Park, Faringdon, for 17980 **The Vamp**, whole colour, born May 19; *s.* Wotton Hustler 16500, *d.* 12461 Circe *by* The Slasher 14143.

1753 IV.—John Pierpont Morgan, Wall Hall, Watford, for 15413 **Aldenham Little Castorette**, whole fawn, born Sept. 5; *s.* Ixia's Little Prince 17215, *d.* 11895 Aldenham Cowslip's Castorette 2nd *by* Aldenham General Cowslip 15481.

1746 R.N.—Lady Violet Henderson, for **Millionairess**.

H.C.—1749, 1757. **C.**—1755.

Cup.[3]—Sir Harry Hague.

R.N. for Cup.[3]—H. Cecil Pelly.

Kerrys.

N.B.—In the Kerry Classes, the number inserted within brackets after the name of an animal indicates the number of such animal in the Royal Dublin Society's Herd Book. A number without brackets indicates that the animal is registered in the British Kerry Herd Book.

Class 194.—*Kerry Bulls, born in or before* 1931.

1761 I.—H. E. Mitchell, Great Pellingbridge Farm, Scaynes Hill, Sussex, for **O. P. H. Pailful Curley 848**, born June 8, 1929, bred by Capt. R. E. Palmer, Newdigate, Surrey; *s.* Pailful Jim of O. P. H. 772, *d.* Elmhurst Cresta 3569 *by* Valencia Linksman 496.

1762 II.—Moore Bros., Cudham Grange, Westerham Hill, Kent, for **Valencia Mohawk 784**, born Aug 28, 1926, bred by Kerry Estates, Ltd., The Warren House, Stanmore; *s.* Valencia Sammy 670, *d.* Valencia Meta 2799 *by* Valencia Lord 1st (782).

1760 III.—The Kerry Cow Dairy Farms, Layer-de-la-Haye, Colchester, for **Drumgaunagh Roderick 883**, born Oct. 3, 1928, bred by Miss P. de B. Bowen-Colthurst; *s.* Drumgaunagh Christopher 799, *d.* Drumgaunagh Rhona 4528 *by* Drumgaunagh Leo 638.

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[1] Prizes, except Fourth, given by the English Jersey Cattle Society.

[2] Special Prize of £10 (First Prize) and £5 (Second Prize) given by the English Jersey Cattle Society for the best Cows or Heifers in Classes 190 to 193, bred by Exhibitor, and milked out to the Judge's satisfaction before being judged.

[3] The "Conyngham" Perpetual Silver Challenge Cup given through the English Jersey Cattle Society for the most points awarded in a combination of entries.

Class 195.—*Kerry Bulls, born in* 1932.

1766 **I. & R.N. for Champion.**[1]—Bertram W. A. Watney, Brookwood Corner, Holmwood, Surrey, for **Brookwood Glentime** 945, born July 5; *s.* O. P. H. Queen's Heir 849, *d.* O. P. H. Glentime Queen 4177 *by* O. P. H. Rathmore Time 605.

1765 **II.**—H. E. Mitchell, Great Pellingbridge Farm, Scaynes Hill Sussex, for **Barrington Primus**, born June 15; *s.* Ard Caein Secundus 749, *d.* Ard Caein Dove 3331 *by* Ard Caein Prince 6th 428.

1764 **III.**—The Kerry Cow Dairy Farms, Layer-de-la-Haye, Colchester, for **Drumgaunagh Rewarder**, born March 22; *s.* Valencia Linksman 496, *d.* Rebecca of Warren 3718 *by* Ruthera Drops 413.

Class 196.—*Kerry Cows, in-milk, born in or before* 1929.

1770 **I. &. Champion.**[1]—Newton R. Steel, The Hookland Estate, Scaynes Hill, Sussex, for **Gort Tulip** 4939, born May 21, 1924, calved May 1, 1933, bred by V. E. Rattray, Gortnaskehy, Ballybunion, Co. Kerry; *s.* Pallas Rover 659, *d.* Bushmount Hawthorn 4892 *by* Pallas Gerald (1078).

1772 **II.**—Bertram W. A. Watney, Brookwood Corner, Holmwood, Surrey, for **Minley Kathleen** 4389, born June 2, 1925, calved June 21, 1933, bred by Laurence Currie, Minley Manor, Farnborough; *s.* Hattingley Arthur 588, *d.* Minley Mione 3418 *by* Sloe Drop 415.

1769 **III.**—H. E. Mitchell, Great Pellingbridge Farm, Scaynes Hill, Sussex, for **Cuckfield Pearl** 4082, born May 20 1925, calved Feb. 4, 1933, bred by J. E. Johnston, Cuckfield, Sussex; *s.* Ard Caein Norval 628, *d.* Buckhurst Pearl 1875 *by* Lackham Puzzler 255.

Class 197.—*Kerry Heifers, in-milk, born in* 1930 *or* 1931.

1776 **I.**—Newton R. Steel, The Hookland Estate, Scaynes Hill, Sussex, for **Hookland Azure**, born Nov. 24, 1930, calved April 30, 1933; *s.* Bauncluone Tulwar 880, *d.* Ballyquin Effie Beag 4311 *by* Larkspur of Carton 652.

1775 **II.**—H. E. Mitchell, Great Pellingbridge Farm, Scaynes Hill, Sussex, for **Barrington Jet** 5108, born May 6, 1930, calved Dec. 20, 1932; *s.* O. P. H. Watertime Sheen 851, *d.* Barrington Pearl Drop 4036 *by* O. P. H. Fitz Darling 595.

1773 **III.**—The Kerry Cow Dairy Farms, Layer-de-la-Haye, Colchester, for **Drumgaunagh Katherine**, born Oct. 26, 1930, calved May 12, 1933, bred by Miss P. de B. Bowen-Colthurst; *s.* Valencia Linksman 496, *d.* Drumgaunagh Katricia 5154 *by* Castle Lough Oliver 431.

Dexters.

N.B.—In the Dexter Classes, the number inserted within brackets after the name of an animal indicates the number of such animal in the Royal Dublin Society's Herd Book. A number without brackets indicates that the animal is registered in the English Dexter Herd Book.

Class 198.—*Dexter Bulls, born in or before* 1931.

1778 **I.**—Thomas A. Emmet, Amberley Castle, Amberley, Sussex, for **Grinstead Smiling Hawker** 1115, born March 18, 1931, bred by Lady Loder, Leonardslee, Horsham; *s.* Pulham Smile 1054, *d.* Grinstead Hawk 3rd 3975 *by* Oakridge Berry 931.

1779 **II.**—Lady Loder, Leonardslee, Horsham, for **Grinstead Smiling Fellow** 1137, born Aug. 21, 1931; *s.* Pulham Smile 1054, *d.* Grinstead Fuchsia 2nd 3974 *by* Grinstead Fred 926.

1777 **III.**—Miss Ethel M. Bower, The Old Cottage, Blackdown, Leamington Spa, for **Blackdown Felix** 1126, born Jan. 3, 1931; *s.* Braxted Goldfinder 1032, *d.* Fillongley Floss 3291 *by* Oakridge Scout 674.

1780 **R.N.**—Mrs. Humphrey R. Pelly, Lyndsays Farm, Ingatestone, Essex, for **Lyndsays Milky Way.**

H.C.—1781.

Class 199.—*Dexter Bulls, born in* 1932.

1784 **I.**—Lady Loder, Leonardslee, Horsham, for **Grinstead Water Nigger**, born Oct. 11; *s.* Ratcliffe Negro's Manager 1096, *d.* Grinstead Watercress 4th 4311 *by* Pulham Smile 1054.

1783 **II.**—Mrs. Ernest Johnson, Ashton Hayes, Chester, for **Grinstead Nigger Boy**, born July 12, bred by Lady Loder, Leonardslee, Horsham; *s.* Ratcliffe Negro's Manager 1096, *d.* Grinstead Hawk 7th 1096 *by* Oakridge Evergood 2nd 1014.

1785 **III.**—John Roland Statter, Castle Morton, Malvern, for **Castle Morton Easter Egg** 1132, born March 27; *s.* Oakridge Bugle 1140, *d.* Oakridge Emerald 10th *by* Oakridge Bramble 105.

1782 **R.N.**—Thomas A. Emmet, Amberley Castle, Amberley, Sussex, for **Amberley Adam.**

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[1] Silver Challenge Cup given by the British Kerry Cattle Society for the best Kerry.

Class 200.—*Dexter Cows, in-milk, any age.*

1788 I. & Champion.[1]—Lady Loder, Leonardslee, Horsham, for **Grinstead Convolvulus 4th** 4305, born March 31, 1930, calved May 1, 1933; *s.* Oakridge Evergood 2nd 1014, *d.* Grinstead Convolvulus 3458 *by* Brokenhurst Penny 2nd 694.

1795 II.—Mrs. T. H. Peyton, Colomendy, Mold, for **Gaynes Gay** 3800, born March 14, 1925 calved May 2, 1933, bred by the Hon. Gerald Wellesley and the Hon. Mrs. Duberly, Gaynes Hall, Huntingdon; *s.* Cobham Blacksmith 727, *d.* La Mancha Liz 2357 F.S.

1789 III.—Lady Loder, for **Grinstead Hawk 5th** 4108, born June 12, 1928, calved May 10, 1933; *s.* Oakridge Evergood 2nd 1014, *d.* Nuthurst Hawk 3rd 3338 *by* Brockhampton Monarch 693.

1790 IV.—The Rev. E. A. Douglas Morgan, Trefonen Rectory, Oswestry, for **Violet** 4030, born July 3, 1927, calved May 12, 1933, bred by Mrs. Pitt Rivers, Rushmore, Salisbury; *s.* Rushmore Rex 862, *d.* Rushmore Ruby 3024 F.S.

1793 R.N.—Mrs. T. H. Peyton, for **Colomendy Gay.**

H.C.—1787. C.—1791.

Class 201.—*Dexter Heifers, in-milk to first calving, born in* 1930 *or* 1931.

1797 I. & R.N. for Champion.[1]—Mrs. Ernest Johnson, Ashton Hayes, Chester, for **Ashtonhayes Glenarde,** born June 17, 1931, calved May 28, 1933; *s.* Grinstead Taxi 1089, *d.* Ashtonhayes Gundred 4163 *by* Grinstead Watersprite 928.

1796 II.—Miss Ethel M. Bower, The Old Cottage, Blackdown, Leamington Spa, for **Blackdown Fascination,** born June 23, 1931, calved June 12, 1933; *s.* Braxted Goldfinder 1032 *d.* Blackdown Duchess 4281 *by* Oakridge Premier 967.

1798 III.—Mrs. Ernest Johnson, for **Ashtonhayes Woodlawn,** born Feb. 14, 1931, calved March 29, 1933; *s.* Grinstead Taxi 1089, *d.* Grinstead Watercress 2774 *by* Hever Tim 636.

Milk Yield Classes.

Class 202.—*Dairy Shorthorn Cows or Heifers.*

1059 I.—Frederick Chapman, Chevet Grange, Wakefield, for **82226 Lowgroves Beauty 5th,** roan, born July 18, 1926, calved June 8, 1933, bred by T. C. Atkinson, Lowgroves, Kendal; *s.* Walnut Leader 185961, *d.* Lowgroves Beauty 4th *by* Hugo 181730.

1062 II.—E. Uwins Gillate, Shawlands, Lingfield, for **76321 Orfold Jessy 2nd,** red, born Nov. 29, 1925, calved April 7, 1933, bred by A. Luckin, Orfold, Wisborough Green; *s.* Orfold Linksman 2nd 150892, *d.* 20856 Kingswood Jessy *by* Tockenham Thrusher 145936.

1078 III.—The Duke of Westminster, G.C.V.O., D.S.O., Eaton Home Farm, Aldford, Chester, for **103259 Lawnhead Moss Rose 20th,** roan, born Aug. 21, 1927, calved May 6, 1933, bred by J. Washington Wardle, Great Bridgeford, Stafford; *s.* Eaton Rose King 207056, *d.* 56371 Moss Rose 27th *by* Hilderstone Marquis 181604.

1110 R.N.—J. Spencer Taylor, for **Whatcote Rosamond.** (See Class 185.)

H.C.—1097, 1114.

Class 203.—*Lincolnshire Red Shorthorn Cows or Heifers.*

1182 I.—Russell Wood, Bendish House, Hitchin, for **Bendish Sunbeam 10th** (vol. 35, p. 419), born May 16, 1928, calved June 9, 1933; *s.* His Son Dairyman 14th 20409, *d.* Bendish Sunbeam 6th *by* Bendish Seaman 7th.

1178 II.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Bendish Poppy 9th** (vol. 32, p. 500), born Feb. 28, 1925, calved March 24, 1933, bred by Russell Wood, Bendish House, Hitchin; *s.* Longford Bendish 19564, *d.* Bendish Poppy 5th *by* King of the Burtons 10020.

1181 III.—Russell Wood, for **Bendish Cherry 27th** (vol. 34, p. 392), born Feb 21, 1927, calved June 16, 1933; *s.* Langford Bendish 19564, *d.* Bendish Cherry 14th *by* Burton Ruby King 2nd 14314.

1169 R.N.—John Evens & Son, for **Burton Royal Starlight 13th.** (See Class 139).

H.C.—1174.

Class 204.—*South Devon Cows or Heifers.*

1210 I.—Dartington Hall, Ltd., The Barton Farm, Dartington Barton, Totnes, for **Milkmaid 33rd** 32403, born Feb. 10, 1926, calved March 19, 1933, bred by W. S. Harris, Aish House, Stoke Gabriel; *s.* Mothecombe Sunbeam 9915, *d.* Milkmaid 16th 23112 *by* Dunstone Moss Rose 7710.

1212 II.—Dartington Hall, Ltd., Old Parsonage Farm, Totnes, for **Dartington Welcome 2nd,** born in 1926, calved May 12, 1933, bred by G. J. Chaffe, Harberton, Totnes; *s.* Prime Minister 9960, *d.* Dartington Welcome 1st *by* Wonton Councillor.

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[1] Silver Challenge Cup given by the Dexter Cattle Society for the best Dexter.

1218 III.—Dartington Hall, Ltd., Old Parsonage Farm, for **Zempson Margaret**, born Sept. 2, 1926, calved June 7, 1933, bred by Mrs. E. F. Andrews, Zempson, South Brent; *s.* Acrobat 10544, *d.* Zempson Marjorie (A53).

1218 R.N.—Miss Jervoise Smith, Sandwell, Harberton, Totnes, for **Dittisham Nina 2nd.**

Class 205.—*Red Poll Cows or Heifers.*

1271 I.—His Majesty the King, for **Necton Daffodil.** (See Class 152.)

1275 II.—J. N. Kendall, Brimpsfield Park, Glos., for **34518 Newnton Bertha**, born March 8, 1924, calved May 4, 1933, bred by M. S. Southern, Estcourt; *s.* Ashmoor Malone 11862, *d.* 29129 Newnton Bessie *by* Ashmoor Ray 11528.

1285 III.—Charles Henry Cearn, Gatwick Farm, Upper Gatton, Reigate, for **41502 Heveningham Daring**, born Dec. 7, 1928, calved April 22, 1933, bred by Lord Huntingfield, Heveningham Hall, Halesworth; *s.* Yorford Proud Prince 14892, *d.* 29098 Middleton Adventure *by* Kettleburgh Red Coat 11893.

1276 R.N.—Lady Loder, Leonardslee, Horsham, for **Horsley Norah.**

Class 206.—*Blue Albion Cows or Heifers.*

1326 I.—T. H. Calderbank, The Hall, Stow Maries, Chelmsford, for **Stow Pansy 11534**, born Aug. 26, 1926, calved May 5, 1933; *s.* Broomhill Threshold 499, *d.* Duchess of Stow 117 S.R.

1332 II.—Charles Henry Webster, for **Ivonbrook Vera.** (See Class 159.)

Class 207.—*British Friesian Cows or Heifers.*

1427 I.—E. G. Barton, for **Combermere Eleanor 2nd.** (See Class 169.)

1430 II.—Frank William Gilbert, for **Killis Queen Belle.** (See Class 169.)

1411 III.—John E. Castle, Curbridge Farm, Witney, for **Curbridge Flora 92070**, born Nov. 1, 1925, calved June 9, 1933; *s.* Mapleton Gladiator 20905, *d.* Curbridge Butterfly 51858 *by* Eastwick Brown 9563.

1425 IV.—Strutt & Parker (Farms) Ltd., The Bury, Hatfield Peverel, Chelmsford, for **Lavenham Seabreeze 4th 107104**, born Aug. 12, 1926, calved June 3, 1933; *s.* Terling Mazeppa 27189, *d.* Lavenham Seabreeze 3rd 73388 *by* Terling Chief 15475.

1410 V.—Mrs. E. J. Butler, Rednal House, Rednal, Birmingham, for **Rednal Queenie**, born Aug. 6, 1924, calved Jan. 8, 1933, bred by J. Masson, Attimore Hall, Hatfield; *s.* Attimore Major 3475, *d.* Attimore Ada 23294 *by* Attimore King.

1409 R.N.—Arthur Barber, Carlton Hall Farm, Worksop, for **Limestone Snowdrop.**
H.C.—1420.

Class 208.—*Ayrshire Cows or Heifers.*

1511 I.—Eshott Pedigree Stock Farms, for **Auchenbrain Miss Craig 34th.** (See Class 177a).

1527 II.—Lt.-Comdr. C. G. Vyner, Studley Royal Home Farm, Ripon, for **Cowdens Jem 2nd 84287**, born Aug. 21, 1921, calved May 3, 1933, bred by G. B. Spence, Cowdens, Lockerbie; *s.* Cowdens Speculator 20492, *d.* Cowdens Jem 78298 *by* Cowdens Union Jack 14947.

1506 III.—Comdr. E. W. Billyard-Leake, Hollybush House, Hollybush, Ayr, for **Dalgig Lady Maud 3rd 4815**, born June 8, 1925, calved June 12, 1933, bred by Jacob S. Murray, Dalgig, New Cumnock; *s.* Dalgig Baron 23163, *d.* Lady Maud 86638 *by* Muir General French 14573.

Class 209.—*Guernsey Cows or Heifers.*

1595 I.—Esmond D. Fairweather, The Manor House, Waltham St. Lawrence, Berks., for **29029 May Boy Daisy of the Blanche**, fawn and white, born June 6, 1924, calved June 12, 1933, bred by Mrs. G. Rose, Les Blanches, St. Martins, Guernsey; *s.* Valentine of Vimiera 5707 P.S., *d.* 17686 P.S. May Boy Daisy of Catel Farm *by* May Boy of Mont Plaisant 3862 P.S.

1605 II.—Lord Swaythling, Town Hill Park, West End, Southampton, for **29224 Otterbourne Sylvia**, fawn and white, born Sept. 7, 1928, calved March 29, 1933, bred by Edward Christian, Otterbourne House, Winchester; *s.* Victor of Les Grantes 5813, *d.* 24166 Otterbourne Fancy *by* Prince 2nd of the Simons 5618.

1597 III.—Carl Holmes, Clover Top Farm, Codicote, Hitchin, for **29544 Dairy Nellie's Queen**, fawn and white, born March 16, 1925, calved April 20, 1933, bred by T. Mauger, Tertie, St. Andrews, Guernsey; *s.* Charmante's Loyal 4758 P.S., *d.* 24920 P.S. Nellie's Queen of Clovelly *by* Lord Rhondda 250 P.S., R.A.A.S.

1602 R.N.—Mrs. J. Sutcliffe Pyman, for **Sequel's May Belle 4th.** (See Class 183.)
H.C.—1616, 1618, 1619.

Class 210.—*Jersey Cows or Heifers.*

1680 I.—Grosvenor Berry, Mount Bures, Bures, Suffolk, for **11255 March Dinah**, whole colour, born March 21, 1928, calved March 21, 1933; *s.* Black Art 15590, *d.* 7297 Winter Dinah *by* Nimrod 14890.

1681 II.—Mrs. Evelyn, Wotton House, Dorking, for **15068 Wotton Early Minx**, whole colour, born Jan. 14, 1928, calved May 25, 1933; *s.* Henbury Sunrise 15873, *d.* Fairlawne Hussy *by* Sir Toby 12154.

1703 **III.**—E. A. Strauss, M.P., Kingston Bagpuize, Abingdon, for **8897 Blush,** whole colour, born Jan. 28, 1927, calved March 1, 1933, bred by Dr. H. Watney, Buckhold, Pangbourne; *s.* Coon 15618, *d.* 5988 Blonde *by* Gull 14866.
1690 **IV.**—Capt. E. L. Hughes, R.N., Spring Hill, Capel, Ipswich, for **17548 Princess Peggy,** whole colour, born Oct. 24, 1928, calved June 20, 1933; *s.* Kentwins Yellow Prince 16310, *d.* Peggy 5th *by* Goddington Noble 16th 12819.
1678 **V.**—Grosvenor Berry, for **10470 Black Art's Postgirl,** whole colour, born March 20, 1928, calved March 24, 1933; *s.* Black Art 15590, *d.* 6968 Postgirl 2nd *by* Nimrod 14890.
1686 **R.N.**—Capt. R. S. Hall, New Hall, Tendring, Essex, for **Cosy.**
H.C.—1679, 1687, 1699, 1700, 1702, 1704, 1705, 1719. **C.**—1721, 1726.

Class 211.—*Kerry Cows or Heifers.*

1770 **I. & Champion.**[1]—Newton R. Steel, for **Gort Tulip.** (See Class 196.)
1771 **II. & R.N. for Champion.**[1]—Newton R. Steel, for **Pallas Victoria 5044,** born March 8, 1924, calved April 1, 1933, bred by J. C. McKay, Pallas House, Beaufort, Co. Kerry; *s.* Valencia Czar 534, *d.* Pallas Vanity 2747 *by* Pallas Paddy 2nd (818).
1768 **III.**—The Kerry Cow Dairy Farms, Layer-de-la-Haye, Colchester, for **Drumgaunagh Verena 4925,** born July 20, 1926, calved May 18, 1933, bred by Miss P. de B. Bowen-Colthurst; *s.* Valencia Linksman 496, *d.* Drumgaunagh Veronica 2601 F.S.
1769 **R.N.**—H. E. Mitchell, for **Cuckfield Pearl.** (See Class 196.)
H.C.—1767.

Class 212.—*Dexter Cows or Heifers.*

1795 **I. & Champion.**[2]—Mrs. T. H. Peyton, for **Gaynes Gay.** (See Class 200.)
1789 **II. & R.N. for Champion.**[2]—Lady Loder, for **Grimstead Hawk 5th.** (See Class 200).
1790 **III.**—The Rev. E. A. Douglas Morgan, for **Violet.** (See Class 200.)
1798 **R.N.**—Mrs. Ernest Johnson, for **Ashtonhayes Woodlawn.** (See Class 201.)
H.C.—1788, 1791.

Butter Tests.

Class 213.—*Cows of the Guernsey, Jersey, Kerry and Dexter Breeds.*

1605 **I. & R.N. for Champion.**[3]—Lord Swathling, for **Otterbourne Sylvia.** (See Class 209.)
1703 **II. & G.M.**[4]—E. A. Strauss, M.P., for **Blush.** (See Class 210.)
1699 **III. & S.M.**[4]—H. S. Mountain, Groombridge Place, Kent, for **8554 Sir Laurel's Berthe,** broken colour, born July 26, 1926, calved Feb. 12, 1933; *s.* Sir Laurel 15228, *d.* 2795 Xenia's Berthe *by* Xenia's Sultan 13798.
1681 **IV. & B.M.**[4]—Mrs. Evelyn, for **Wotton Early Minx.** (See Class 210.)
1680 **V.**—Grosvenor Berry, for **March Dinah.** (See Class 210.)
1700 **R.N. & C.M.**[5]—H. S. Mountain, for **Sir Laurence's Imogen.**
H.C. & C.M.[5]—1678, 1679, 1686, 1690, 1698, 1702, 1704, 1719, 1721, 1726.
H.C.—1597, 1616.

Class 214.—*Cows of any other Breed.*

1210 **I. & Champion.**[3]—Dartington Hall, Ltd., for **Milkmaid 33rd.** South Devon. (See Class 204.)
1506 **II.**—Comdr. E. W. Billyard-Leake, for **Dalgig Lady Maud 3rd.** Ayrshire. (See Class 208.)
1218 **III.**—Dartington Hall, Ltd., for **Zempson Margaret.** South Devon. (See Class 204.)
1427 **IV.**—E. G. Barton, for **Combermere Eleanor 2nd.** British Friesian. (See Class 169.)
1212 **V.**—Dartington Hall, Ltd., for **Dartington Welcome 2nd.** South Devon. (See Class 204.)
1181 **R.N.**—Russell Wood, for **Bendish Cherry 27th.** Lincs. Red Shorthorn. (See Class 203.)
H.C.—1169, 1178, 1182, 1218, 1409, 1411, 1527.

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[1] The "Elmhurst" Perpetual Silver Challenge Cup given by the British Kerry Cattle Society for the Kerry Cow gaining the highest number of points.

[2] Perpetual Silver Challenge Cup given by the Dexter Cattle Society for the Dexter Cow gaining the highest number of points.

[3] Champion Gold Medal given for the Cow obtaining the highest number of points.

[4] Gold Medal (or £10 in money), Silver Medal and Bronze Medal given by the English Jersey Cattle Society for the three Jersey Cows obtaining the greatest number of points in the Butter Tests.

[5] Certificates of Merit given by the English Jersey Cattle Society for Jersey Cows, not being Prize Winners, obtaining the following points: Cows four years old and under, 36; cows over four years old, 41.

GOATS.[1]

The Prizes in each Class for Goats are: First Prize, £5; Second Prize, £3; Third Prize, £2; Fourth Prize, £1; Fifth Prize, 10s.

Class 215.—*Toggenburg or British Toggenburg Female Goats, in-milk, any age.*

1801 **I., Champion,[2] R.N. for Champion[3] & R.N. for Champion.[4]**—Miss Mary Burgess, Olivers Stray, Sutton Grange, Ripon, for **Murrayston Clyne 696**, Toggenburg, born March 1, 1930, kidded Feb. 12, 1933; *s.* Murrayston Buchan 632, *d.* Riding Clytie 548 *by* Leazes Benjamin 482.

1806 **II. & Champion.[5]**—Mrs. Morcom, Clock House, Bromsgrove, for **Cornish Jujube 8883**, British Toggenburg, born March 7, 1928, kidded Jan. 14, 1932; *s.* Cornish Quirk 6979, *d.* Cornish Delight 7846 *by* Ridgeway Ranunculus.

1800 **III. & R.N. for Champion.[2]**—Miss Mary Burgess, for **Murrayston Clyde 678**, Toggenburg, born Feb. 15, 1929, kidded March 20, 1933; *s.* Leazes Prince Hal 643, *d.* Riding Clytie 548 *by* Leazes Benjamin 482.

1803 **R.N.**—Miss Bruce Farrer, The Grange, Kenninghall, Norwich, for **Hargrave Saintomer S.R. 487**, British Toggenburg, born May 18, 1929, kidded March 8, 1933; *s.* Fryston Sprig 620, *d.* Marye 472 *by* Parham.

H.C.—1807. **C.**—1805.

Class 216.—*Saanen or British Saanen Female Goats, in-milk, any age.*

1817 **I., Champion,[3] Champion,[4] & Champion.[6]**—Miss Mostyn Owen, The Cottage, Huntington, York, for **Mostyn Marigold 8650**, British Saanen, born Feb. 15, 1928, kidded March 3, 1931; *s.* Didgemere Aristocrat 8207, *d.* Classic Pandora 1st 4891 *by* Prophet of Bashley 3775.

1811 **II. & Champion[7].**—Miss Cecily Booth, Yore Croft, Ripon, for **Springfield Lizette 104**, Saanen, born March 4, 1928, kidded March 6, 1933; *s.* Broxbourne Gold 62, *d.* Springfield Lealty 73 *by* Gulden.

1820 **III. & R.N. for Champion[6].**—Miss K. Parker, Grove House, Tarvin, Chester, for **Heddon Sarah 85**, British Saanen, born March 5, 1928, kidded March 9, 1932, bred by Miss E. Skidmore, Ashley Leigh, Box, Wilts.; *s.* Broxbourne Golden 8045, *d.* Heddon Sophia 7281 *by* Peter of Bashley 4207.

1824 **IV.**—Miss E. Skidmore, Ashley Leigh, Box, Wilts, for **Heddon Shoe 10231**, British Saanen, born April 13, 1930, kidded April 15, 1933; *s.* Springfield Luke 121, *d.* Heddon Saltcellar 7446 *by* Peter of Bashley 4207.

1814 **R.N.**—J. R. Egerton, Malpas Cottage, Rushmere, Ipswich, for **Worlington Wavey.**

H.C.—1808, 1812, 1821. **C.**—1816, 1819.

Class 217.—*Anglo-Nubian Female Goats, in-milk, any age.*

[No Award.]

Class 218.—*British Alpine Female Goats, in-milk, any age.*

1834 **I. & Champion.[8]**—Mrs. Roger Wethered, Tadley Place Farm, Basingstoke, for **Didgemere Deluxe 142**, born April 12, 1929, kidded Feb. 22, 1933, bred by Mrs. Abbey, Downe Hall, Roydon; *s.* Didgemere Doctor 65, *d.* Didgemere Delysia 50.

1833 **II. & R.N. for Champion.[8]**—Mrs. Roger Wethered, for **Didgemere Decree 126**, born March 9, 1930, kidded Feb. 26, 1933, bred by Mrs. Abbey, Downe Hall, Roydon; *s.* Didgemere Dago 66, *d.* Didgemere Degree 64.

1831 **III.**—Mrs. Roger Wethered, for **Boddington Bluebell 10297**, born April 12, 1931, kidded March 6, 1933; *s.* Didgemere Dago 66, *d.* Didgemere Delgada 8829.

1830 **R.N.**—Mrs. Estyn-Jones, Mabbitt's Horn, Ludlow, for **Didgemere Dena.**

Class 219.—*Female Goats, in-milk, any age, any other variety.*

1838 **I.**—Miss C. Chamberlain, Westons, Lyndhurst, for **Wavelet of Westons 9377**, British, born June 21, 1929, kidded March 25, 1933; *s.* Springfield Count 8514, *d.* Champion Worthy of Westons 7969 *by* Poet of Bashley 7457.

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[1] £30 towards these prizes was given by the British Goat Society, and all the Challenge Certificates and Medals enumerated below, and on pages lxxv and lxxvi.

[2] Breed Challenge Certificate for the best Toggenburg Female Goat, over 2 years old.

[3] Challenge Certificate for the best Female Goat over 2 years old that has borne a kid.

[4] Bronze Medal for the best Female Goat.

[5] Breed Challenge Certificate for the best British Toggenburg Female Goat, over 2 years old.

[6] Breed Challenge Certificate for the best British Saanen Female Goat, over 2 years old.

[7] Challenge Certificate for the best Saanen Female Goat over 2 years old.

[8] Breed Challenge Certificate for the best British Alpine Female Goat, over 2 years old.

1848 **II.**—Mrs. Roger Wethered, Tadley Place Farm, Basingstoke, for **Didgemere Darkie** 9623, British, born April 15, 1929, kidded April 14, 1933, bred by Mrs. Abbey, Downe Hall, Roydon; *s.* Prophet of Bashley 3775, *d.* Didgemere Dark 6405.

1849 **III.**—Mrs. Roger Wethered, for **Didgemere Foxglove** 10208, British, born Feb. 8, 1931, kidded March 10, 1933, bred by Mrs. Abbey, Downe Hall, Roydon; *s.* Didgemere Dago 66, *d.* Didgemere Digit 9130.

1841 **IV.**—Miss E. M. Gresley Hall, Chestnut Tree House, Willersey, Broadway, Worcs., for **Webb Larkspur** 10202, British, born April 17, 1931, kidded May 2, 1933; *s.* Pastor of Bashley 8034, *d.* Webb Lively 8275 *by* Priest of Bashley 6926.

1835 **R.N.**—Miss Alexander, Byards Lodge, Knaresborough, for **Stockwell Tsariza.**
H.C.—1836.

Class 220.—*Toggenburg, British Toggenburg, Saanen or British Saanen Goatlings, over* 1 *but not exceeding* 2 *years old.*

1851 **I. & Champion.**[1]—Miss Cecily Booth, Yore Croft, Ripon, for **Springfield Colleen** 10523, British Saanen, born Feb. 17, 1932; *s.* Springfield Loyalty 74, *d.* Springfield Unity 6370 *by* Feltham Siegfried 41.

1856 **II.**—Miss Mostyn Owen, The Cottage, Huntingdon, York, for **Mostyn Matchless** 10588, British Saanen, born March 20, 1932; *s.* Mostyn Mariposa 280, *d.* Mostyn Melba 9041 *by* Didgemere Aristocrat 8207.

1853 **III.**—Miss C. Chamberlain, Westons, Lyndhurst, for **Worthwhile of Westons** 10551, British Toggenburg, born April 3, 1932; *s.* Raydon Nougat 10184, *d.* Wavelet of Westons 9377 *by* Springfield Count 8514.

1854 **IV.**—Miss Bruce Farrer, The Grange, Kenninghall, Norwich, for **Hargrave Diadem** 330, British Saanen, born Feb. 18, 1932; *s.* Didgemere Aristocrat 105, *d.* Didgemere Dismay 215 *by* Didgemere Doctor 8436.

1858 **R.N.**—Miss K. Parker, Grove House, Tarvin, Chester, for **Silver of Delamere.**
H.C.—1850, 1852, 1855, 1861. **C.**—1859, 1860.

Class 221.—*Anglo-Nubian Goatlings, over* 1 *but not exceeding* 2 *years old.*

1862 **I.**—J. R. Egerton, Malpas Cottage, Rushmere, Ipswich, for **Malpas Merilees** 2147, born Feb. 16, 1932; *s.* Hoveton Freckle 1873, *d.* Malpas Magnolia 13 *by* Hoveton Friar 1874.

Class 222.—*Goatlings, any other variety, over* 1 *but not exceeding* 2 *years old.*

1868 **I. & R.N. for Champion.**[1]—Mrs. Estyn-Jones, Mabbitts Horn, Ludlow, for **Mabbittshorn Madcap** 10495, British Alpine, born March 12, 1932; *s.* Didgemere Pilot 10207, *d.* Didgemere Delrita 9705 *by* Didgemere Angus 7161.

1874 **II.**—Mrs. Roger Wethered, Tadley Place Farm, Basingstoke, for **Didgemere Domore** 10756, British, born Feb. 19, 1932, bred by Mrs. Abbey, Downe Hall, Roydon; *s.* Didgemere Angus 7161, *d.* Didgemere Dolittle 10425.

1866 **III.**—Miss C. Chamberlain, Westons, Lyndhurst, for **Wonbywaiting of Westons** 10550, British, born April 3, 1932; *s.* Raydon Nougat 10184, *d.* Wavelet of Westons 9377 *by* Springfield Count 8514.

1867 **IV.**—J. R. Egerton, Malpas Cottage, Rushmere, Ipswich, for **Malpas Milicent** 177, British Alpine, born April 23, 1932; *s.* Didgemere Actor 85, *d.* Rosenoir 9724 *by* Didgemere Quack 8831.

1871 **R.N.**—Mrs. G. M. Soames, Long Buckby Wharf, Rugby, for **Pytchley Coquette.**
H.C.—1870, 1872, 1873. **C.**—1865.

Class 223.—*Female Kids, any variety, not over* 1 *year old.*

1893 **I.**—Mrs. G. M. Soames, Long Buckby Wharf, Rugby, for **Pytchley Sunshine** 10859, British, born Feb. 10, 1933; *s.* Pytchley Carol 7671, *d.* Rushetts Starlight 7112 *by* Rayleigh Samson 5986.

1896 **II.**—Mrs. Roger Wethered, Tadley Place Farm, Basingstoke, for **Boddington Daphne** 10892, British, born Feb. 13, 1933; *s.* Didgemere Dago 66, *d.* Didgemere Dixena 9134 *by* Didgemere Doctor 65.

1878 **III.**—J. R. Egerton, Malpas Cottage, Rushmere, Ipswich, for **Mostyn Merise** 10883, British, born Dec. 1, 1932, bred by Miss Mostyn Owen, The Cottage, Huntington, York; *s.* Wansbeck of Westons 146, *d.* Rydale Daisy 183 *by* Gulden 37.

1891 **IV.**—Miss K. Parker, Grove House, Tarvin, Chester, for **Jean of Delamere** 223, Saanen, born Jan. 24, 1933; *s.* Broxbourne Gold 62, *d.* Didgemere Joan 160 *by* Ridgeway Ruric 112.

1892 **V.**—Miss K. Parker, for **Prickle** 333, British Saanen, born July 25, 1932, bred by Mrs. Harrop, Pen Isa, Glascoed, St. Asaph; *s.* Broxbourne Gold 62, *d.* Heddon Spark 86 *by* Springfield Vitality 89.

1875 **R.N.**—Mrs. Browell, Ringletts Farm, Battle, Sussex, for **Feltham Flash.**
H.C.—1880, 1881, 1884, 1894, 1895. **C.**—1877, 1879, 1885, 1889, 1890.

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[1] **Bronze Medal for the best Goatling.**

Milk Yield Classes.

Class 224.—*Milk Yield Class, Quality, open to animals entered in Classes 215 to 219.*

1817 **I., Champion,[1] Champion,[2] & (with 1856) Champion.[3]**—Miss Mostyn Owen, for **Mostyn Marigold.** (See Class 216.)

1836 **II.**—Mrs. Browell, Ringletts Farm, Battle, Sussex, for **Feltham Frisky** 10143, Anglo Nubian Swiss, born March 5, 1931, kidded Feb. 24, 1933; *s.* Playwright of Bashley 8035, *d.* Play of Bashley 6540 *by* Herne Bay Thark.

1812 **III.**—J. R. Egerton, Malpas Cottage, Rushmere, Ipswich, for **Malpas Meadowsweet** 150, British Saanen, born Feb. 18, 1929, kidded Feb. 12, 1933; *s.* Fransham Ferdinand 8062, *d.* Theydon Perfection 45 *by* Ridgeway Rumpelstiltskin 6536.

1814 **IV. & (with 1862) R.N. for Champion.[3]**—J. R. Egerton, for **Worlington Wavey** 133, British Saanen, born Feb. 25, 1929, kidded April 17, 1931, bred by Mrs. Clayton Swan, Poulton Grange, Fairford; *s.* Springfield Fortuity 88, *d.* Ridgeway Ringlet 8124 *by* Ridgeway Rip Van Winkle 87.

1843 **V.**—Mrs. Morcom, Clock House, Bromsgrove, for **Cornish Saccharine** 10302, British, born Feb. 22, 1931, kidded Feb. 27, 1933; *s.* Fryston Sansovino 567, *d.* Cornish Fondant 3882 *by* Cornish Quirk 6979.

1824 **R.N., R.N. for Champion[1] & R.N. for Champion.[2]**—Miss E. Skidmore, Ashley Leigh, Box, Wilts., for **Heddon Shoe.**

H.C.—1801, 1803, 1806, 1811, 1820, 1821, 1830, 1835, 1840, 1841.

1831 **Champion.[4]**—Mrs. Roger Wethered, for **Boddington Bluebell.** (See Class 218).

Class 225.—*Milk Yield Class, Quantity, open to animals entered in Classes 215 to 219.*

1817 **I.**—Miss Mostyn Owen for **Mostyn Marigold.** (See Class 216.)
1814 **II.**—J. R. Egerton, for **Worlington Wavey.** (See Class 224.)
1806 **III.**—Mrs. Morcom, for **Cornish Jujube.** (See Class 215.)
1812 **IV.**—J. R. Egerton, for **Malpas Meadowsweet.** (See Class 224.)
1843 **V.**—Mrs. Morcom, for **Cornish Saccharine.** (See Class 224.)
1836 **R.N.**—Mrs. Browell, for **Feltham Frisky.** (See Class 224.)
H.C.—1808, 1816, 1820, 1824, 1835, 1844, 1849.

SHEEP.

Unless otherwise stated, the Prizes in each Class for Sheep are: First Prize, £10; Second Prize, £5; Third Prize, £3; Fourth Prize, £2; Fifth Prize, £1.

Oxford Downs.

Class 226.—*Oxford Down Shearling Rams.*

1905 **I. Champion[5] & Champion,[6] 1902 III., 1903 IV., & 1904 R.N.**—Hugh William Stilgoe The Grounds, Adderbury, Banbury.
1901 **II.**—Hobbs & Davis, Kelmscott, Lechlade, Glos.
1897 **V.**—Ernest G. Clifford, Mawley Farm, Quenington, Fairford, Glos.
H.C.—1900. **C.**—1908.

Class 227.—*Oxford Down Ram Lambs.*

1915 **I.**—S. C. Wakefield, Langford Downs, Lechlade, Glos.
1916 **II.**—W. F. G. Watts, Elsfield, Oxford.
1911 **III.**—Major R. F. Fuller, Great Chalfield, Melksham, Wilts.
1913 **IV., & 1914 R.N.**—Hugh William Stilgoe, The Grounds, Adderbury, Banbury.
H.C.—1912.

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[1] Challenge Certificate for the best Dual Purpose Goat, over 2 years old, that has borne a kid.

[2] The "Chamberlain" Challenge Cup for the Saanen or British Saanen Goat gaining the highest number of points in Inspection and Milking. The goat must be bred by exhibitor, entered in the Saanen or British Saanen section of the Herd Book, and have obtained an award in the Inspection Class.

[3] The "Dewar" Challenge Cup given through the British Goat Society for the exhibitor showing a Female Goat in-milk, and a Goatling, under certain conditions.

[4] The "Abbey" Challenge Cup given through the British Goat Society for the British Alpine Goat gaining the highest number of points in Inspection and Milking. The goat must be bred by exhibitor, entered in the British Alpine section of the Herd Book, and have obtained an award in the Inspection Class.

[5] The "Fernham" Silver Challenge Cup given through the Oxford Down Sheep Breeders' Association for the best Male exhibit.

[6] The "Northwick" Silver Challenge Cup given through the Oxford Down Sheep Breeders' Association for the best exhibit.

Class 228.—*Three Oxford Down Ram Lambs.*

1924 I., R.N. for Champion[1] & R.N. for Champion[2]—W. F. G. Watts, Elsfield, Oxford.
1923 II.—S. C. Wakefield, Langford Downs, Lechlade, Glos.
1918 III.—Lawrence B. Akers, Litchfield Farm, Enstone, Oxford.
1919 R.N.—Ernest G. Clifford, Mawley Farm, Quenington, Fairford, Glos.
H.C.—1922. C.—1920.

Class 229.—*Three Oxford Down Shearling Ewes.*

1926 I. & Champion.[3]—Hobbs & Davis, Kelmscott, Lechlade, Glos.
1927 II. & R.N. for Champion.[3]—Hugh William Stilgoe, The Grounds, Adderbury Banbury.
1928 III.—W. F. G. Watts, Elsfield, Oxford.
1929 R.N.—G. H. Willis, Birdlip, Gloucester.

Class 230.—*Three Oxford Down Ewe Lambs.*

1936 I.—W. F. G. Watts, Elsfield, Oxford.
1935 II.—S. C. Wakefield, Langford Downs, Lechlade, Glos.
1930 III.—Lawrence B. Akers, Litchfield Farm, Enstone, Oxford.
1931 R.N.—Ernest G. Clifford, Mawley Manor, Quenington, Fairford, Glos.
H.C.—1934.

Shropshires.

Class 231.—*Shropshire Shearling Rams.*

1947 I. & Champion,[4] & 1948 IV.—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shropshire.
1944 II. & R.N. for Champion.[4]—Mrs. Inge, Thorpe Hall, Tamworth.
1938 III.—John M. Belcher, Tibberton Green, Wellington, Shropshire.
1942 R.N.—William Everall, Shrawardine Castle, Shrewsbury.
H.C.—1943. C.—1941, 1946.

Class 232.—*Shropshire Ram Lambs.*[5]

1954 I., and 1953 II.—Major J. N. Ritchie, Tern, Wellington, Shropshire.
1951 III.—William Everall, Shrawardine Castle, Shrewsbury.
1955 R.N.—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shropshire.
H.C.—1950. C.—1956.

Class 233.—*Three Shropshire Ram Lambs.*

1962 I.—Mrs. Inge, Thorpe Hall, Tamworth.
1963 II.—Major J. N. Ritchie, Tern, Wellington, Shropshire.
1957 III.—John M. Belcher, Tibberton Green, Wellington, Shropshire.
1961 R.N.—William Everall, Shrawardine Castle, Shrewsbury.
H.C.—1964. C.—1958.

Class 234.—*Shropshire Shearling Ewes.*

1973 I. & Champion.[6]—Mrs. Inge, Thorpe Hall, Tamworth.
1975 II. & R.N. for Champion.[6]—Major J. N. Ritchie, Tern, Wellington, Shropshire.
1971 III.—William Everall, Shrawardine Castle, Shrewsbury.
1968 R.N.—Mrs. F. Brian Bibby, Sansaw, Shrewsbury.
H.C.—1974.

Class 235.—*Three Shropshire Ewe Lambs.*

1981 I.—Major J. N. Ritchie, Tern, Wellington, Shropshire.
1976 II.—John M. Belcher, Tibberton Green, Wellington, Shropshire.
1979 III.—William Everall, Shrawardine Castle, Shrewsbury.
1980 R.N.—Mrs. Inge, Thorpe Hall, Tamworth.
H.C.—1978.

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[1] The "Fernham" Silver Challenge Cup given through the Oxford Down Sheep Breeders' Association for the best Male exhibit.

[2] The "Northwick" Silver Challenge Cup given through the Oxford Down Sheep Breeders' Association for the best exhibit.

[3] The "Broadwell" Silver Challenge Plate given through the Oxford Down Sheep Breeders' Association for the best Female exhibit.

[4] Champion Silver Medal given by the Shropshire Sheep Breeders' Association for the best Ram or Ram Lamb in Classes 231 and 232.

[5] Prizes given by the Shropshire Sheep Breeders' Association.

[6] The "Hardwicke" Perpetual Silver Challenge Cup, given through the Shropshire Sheep Breeders' Association, for the best exhibit.

Southdowns.

Class 236.—*Southdown Two Shear Rams.*

1988 **I., Champion[1] & Champion.[2]**—John Pierpont Morgan, Wall Hall, Watford, for Aldenham 680 of 1931 21643.
1984 **II.**—John Langmead & Sons, Northwood, Ford, Arundel. for Ford Bovey 21428.
1986 **III.**—Lady Ludlow, Luton Hoo, Luton, for Luton Hoo 324 of 1931 21544.
1985 **R.N.**—John Langmead & Sons, for Ford Bystander.

Class 237.—*Southdown Shearling Rams.*

1999 **I., & R.N. for Champion.[1]**—John Pierpont Morgan, Wall Hall, Watford.
1997 **II., and 1998 R.N.**—Lady Ludlow, Luton Hoo, Luton.
2005 **III.**—Col. Sir Sidney Wishart, Binsted, Arundel.
1995 **IV.**—John Langmead & Sons, Northwood, Ford, Arundel.
H.C.—2001. **C.**—1992.

Class 238.—*Southdown Ram Lambs.*[3]

2020 **I.**—Col. Sir Sidney Wishart, Binsted, Arundel.
2014 **II.**—Lady Ludlow, Luton Hoo, Luton.
2012 **III.**—John Langmead & Sons, Northwood, Ford, Arundel.
2016 **IV.**—William H. Pitts, Woodhorn, Oving, Chichester.
2009 **R.N.**—The Earl of Derby, K.G., Hatchfield Farm, Newmarket.
H.C.—2007, 2021. **C.**—2006, 2018.

Class 239.—*Three Southdown Shearling Rams.*[3]

2028 **I.**—William H. Pitts, Woodhorn, Oving, Chichester.
2025 **II.**—John Langmead & Sons, Northwood, Ford, Arundel.
2026 **III.**—Lady Ludlow, Luton Hoo, Luton.
2027 **R.N.**—John Pierpont Morgan, Wall Hall, Watford.
H.C.—2029. **C.**—2022.

Class 240.—*Three Southdown Ram Lambs.*

2041 **I.**—Col. Sir Sidney Wishart, Binsted, Arundel.
2034 **II.**—John Langmead & Sons, Northwood, Ford, Arundel.
2038 **III.**—William H. Pitts, Woodhorn, Oving, Chichester.
2036 **IV.**—Lady Ludlow, Luton Hoo, Luton.
2037 **R.N.**—John Pierpont Morgan, Wall Hall, Watford.
H.C.—2033. **C.**—2031, 2039.

Class 241.—*Three Southdown Shearling Ewes.*

2043 **I. & R.N. for Champion[2] & Champion.[4]**—John Langmead & Sons, Northwood, Ford, Arundel.
2046 **II. & R.N. for Champion.[4]**—John Pierpont Morgan, Wall Hall, Watford.
2044 **III.**—Lady Ludlow, Luton Hoo, Luton.
2049 **R.N.**—Col. Sir Sidney Wishart, Binsted, Arundel.
H.C.—2047. **C.**—2048

Class 242.—*Three Southdown Ewe Lambs.*

2053 **I.**—John Langmead & Sons, Northwood, Ford, Arundel.
2056 **II.**—John Pierpont Morgan, Wall Hall, Watford.
2055 **III.**—Lady Ludlow, Luton Hoo, Luton.
2058 **IV.**—Mrs. V. G. Stride, Head Hone Farm, Lidsey, Bognor Regis.
2054 **R.N.**—Walter Langmead, Wicks Farm, Yapton, Arundel.
H.C.—2052. **C.**2061.

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[1] Champion Gold Medal, or £10 10*s.* in cash, given by the Southdown Sheep Society for the best Ram or Ram Lamb in Classes 236 to 238.

[2] The "Northumberland" Perpetual Silver Challenge Cup given through the Southdown Sheep Society for the best exhibit.

[3] Prizes, except Fourth, given by the Southdown Sheep Society.

[4] Champion Silver Medal, or £1 in cash, given by the Southdown Sheep Society for the best Pen of Ewes or Ewe Lambs.

Hampshire Downs.

Class 243.—*Hampshire Down Shearling Rams.*

2062 I.—James Herbert Benyon, Englefield House, Reading, for **Englefield Capable.**
2068 II.—J. Onslow Fane, Steventon Manor, Hants.
2066 III.—E. Clifton-Brown, Burnham Grove, Burnham, Bucks.
2065. IV.—Major V. S. Bland, M.C., The Warren, Aldbourne, Wilts.
2063 R.N.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
H.C.—2067, 2070, 2071.

Class 244.—*Hampshire Down Ram Lambs.*

2074 I.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
2073 II.—James Herbert Benyon, Englefield House, Reading.
2084 III.—A. Thomas Loyd, Lockinge House, Wantage.
2082 IV.—G. Meredyth Hope, Basildon Home Farm, Pangbourne.
2080 V.—J. Onslow Fane, Steventon Manor, Hants.
2076 R.N.—Major V. S. Bland, M.C., The Warren, Aldbourne, Wilts.
H.C.—2077, 2079, 2085. C.—2075, 2078, 2081.

Class 245.—*Three Hampshire Down Ram Lambs.*

2088 I. & Champion.[1]—Major V. S. Bland, M.C., The Warren, Aldbourne, Wilts.
2093 II.—A. Thomas Loyd, Lockinge House, Wantage.
2090 III.—J. Onslow Fane, Steventon Manor, Hants.
2087 IV.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
2089 R.N.—E. Clifton-Brown, Burnham Grove, Burnham, Bucks.
H.C.—2086, 2092, 2094. C.—2091.

Class 246.—*Three Hampshire Down Shearling Ewes.*

2096 I. and 2097 R.N.—E. Clifton-Brown, Burnham Grove, Burnham, Bucks.
2095 II.—James Herbert Benyon, Englefield House, Reading.
2098 III.—J. Onslow Fane, Steventon Manor, Hants.

Class 247.—*Three Hampshire Down Ewe Lambs.*

2102 I. & R.N. for Champion.[1]—Major V. S. Bland, M.C., The Warren, Aldbourne, Wilts.
2106 II.—A. Thomas Loyd, Lockinge House, Wantage.
2103 III.—E. Clifton-Brown, Burnham Grove, Burnham, Bucks.
2101 IV.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
2105 R.N.—G. Meredyth Hope, Basildon Home Farm, Pangbourne.
H.C.—2100, 2104, 2107.

Suffolks.

Class 248.—*Suffolk Two Shear Rams.*

2108 I.—R. L. Barclay, C.B.E., Higham, Bury St. Edmunds, for **Stetchworth Higham 2nd 22018**, bred by the Earl of Ellesmere, Stetchworth, Newmarket.
2110 II.—Hollesley Bay Labour Colony, Hollesley, Woodbridge, for **Colony Selection 22197.**
2111 III.—Stuart Paul, Kirton Lodge, Ipswich, for **Kirton Special 22786.**
2109 R.N.—George Hazel, Acorn Farm, Arley, Coventry, for **Arley Cob.**

Class 249.—*Suffolk Shearling Rams.*

2118 I.—Stuart Paul, Kirton Lodge, Ipswich, for **Kirton Supreme 22787.**
2117 II.—John Long, The Poplars, Ashbocking, Ipswich, for **Ashbocking Fingringhoe Lord.**
2115 III.—Hollesley Bay Labour Colony, Hollesley, Woodbridge.
2122 R.N.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Yeldham Edgar.**

Class 250.—*Suffolk Ram Lambs.*

2127 I.—Hollesley Bay Labour Colony, Hollesley, Woodbridge.
2132 II.—Stuart Paul, Kirton Lodge, Ipswich.
2135 III.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill.
2129 IV.—John R. Keeble & Son, Brantham Hall, Manningtree, Essex.
2124 V. and 2125 R.N.—The Earl of Ellesmere, Hall Farm, Newmarket.
H.C.—2134. C.—2131.

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[1] Champion Prize of £10 given by the Hampshire Down Sheep Breeders' Association for the best exhibit.

Class 251.—*Three Suffolk Ram Lambs.*[1]

2142 I. & Champion.[2]—John R. Keeble & Son, Brantham Hall, Manningtree, Essex.
2144 II.—Stuart Paul, Kirton Lodge, Ipswich.
2146 III.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill.
2140 IV.—Hollesley Bay Labour Colony, Hollesley, Woodbridge.
2143 R.N.—John Long, The Poplars, Ashbocking, Ipswich.
H.C.—2138.

Class 252.—*Suffolk Shearling Ewes.*

2152 I. and 2153 II.—Hollesley Bay Labour Colony, Hollesley, Woodbridge.
2151 III.—George Hazel, Acorn Farm, Arley, Coventry.
2155 IV.—Sir Prince Prince-Smith, Bart., Southburn House, Driffield.
2149 R.N.—The Earl of Ellesmere, Hall Farm, Newmarket.
H.C.—2150, 2157. C.—2147.

Class 253.—*Three Suffolk Ewe Lambs.*

2164 I. & R.N. for Champion.[2]—John Long, The Poplars, Ashbocking, Ipswich.
2159 II.—The Earl of Ellesmere, Hall Farm, Newmarket.
2165 III.—Stuart Paul, Kirton Lodge, Ipswich.
2162 R.N.—John R. Keeble & Son, Brantham Hall, Manningtree, Essex.
H.C.—2161, 2167.
Cup.[3]—Hollesley Bay Labour Colony.
R.N. for Cup.[3]—Stuart Paul.

Dorset Downs.

Class 254.—*Dorset Down Rams, Shearling and Upwards.*

2170 I. & Champion.[4]—P. & C. Seward, Weston, Petersfield, for **Weston Swell 2nd**, born in 1931.
2168 II.—The Earl of Elgin and Kincardine, K.T., Broomhall, Dunfermline, for ram born in 1932.
2169 III.—John Joyce, Preston, Milverton, Somerset, for **Weston Monarch**, born in 1928, bred by P. & C. Seward, Weston, Petersfield.

Class 255.—*Dorset Down Ram Lambs.*[5]

2174 I. & R.N. for Champion[4] and 2173 II.—P. & C. Seward, Weston, Petersfield.
2172 III.—John Joyce, Preston, Milverton, Somerset.
2171 R.N.—The Earl of Elgin and Kincardine, K.T., Broomhall, Dunfermline.

Class 256.—*Dorset Down Shearling Ewes.*

2175 I. and 2176 III.—The Earl of Elgin and Kincardine, K.T., Broomhall, Dunfermline.
2177 II.—John Joyce, Preston, Milverton, Somerset.

Dorset Horns.

Class 257.—*Two Dorset Horn Ram Lambs, born on or after October* 1, 1932.[6]

2181 I. & Champion[7] and 2180 II.—W. Rupert Tory, Clenstone Manor, Blandford.
2179 III.—The Earl of Elgin and Kincardine, K.T., Broomhall, Dunfermline.

Class 258.—*Two Dorset Horn Shearling Ewes, born on or after October* 1, 1931.

2185 I. and 2184 II.—W. Rupert Tory, Clenstone Manor, Blandford.
2182 III.—The Earl of Elgin and Kincardine, K.T., Broomhall, Dunfermline.

Class 259.—*Two Dorset Horn Ewe Lambs, born on or after October* 1, 1932.

2188 I. & R.N. for Champion,[7] and 2189 II.—W. Rupert Tory, Clenstone Manor, Blandford.
2187 III.—Lt.-Col. Lord Cochrane of Cults, Crawford Priory, Springfield, Fife.

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[1] Prizes, except Fourth, given by the Suffolk Sheep Society.

[2] Perpetual Challenge Plate and £5 in cash given by the Suffolk Sheep Society for the best exhibit.

[3] The "Southburn" Silver Challenge Cup given through the Suffolk Sheep Society for the most points awarded in a combination of entries.

[4] Champion Prize of £5 given by the Dorset Down Sheep Breeders' Association for the best exhibit.

[5] Prizes given by the Dorset Down Sheep Breeders' Association.

[6] Prizes given by the Dorset Horn Sheep Breeders' Association.

[7] Champion Prize of £5 given by the Dorset Horn Sheep Breeders' Association for the best exhibit.

Wiltshire Horns.

Class 260.—*Wiltshire Horn Rams, Two Shear and Upwards.*[1]

2190 I. & Champion.[2]—C. E. Gilby, The Olde House, Spratton, Northampton, for Brockhall Conquest, 2440, born in 1929, bred by Brodie Bros., Brockhall, Flore.
2192 II.—A. Gowling, Snowford Hall, Leamington Spa, for Upton Romeo 2822, born in 1930, bred by S. K. Spokes, Upton Lodge, Northampton.
2193 III.—W. B. Southernwood, Gubblecote, Tring, for Beachampton Pride, born in 1931.

Class 261.—*Wiltshire Horn Shearling Rams.*

2194 I. & R.N. for Champion.[2]—Brodie Bros., Brockhall, Flore, Northampton, for Wern Defender 3265, bred by John Owen, Menai Bridge.
2195 II.—C. E. Gilby, Spratton, Northampton, for ram, bred by W. T. Manning, Wing.
2196 III.—A. Gowling, Snowford Hall, Leamington Spa, for Snowford Sunset 2nd 3191.

Class 262.—*Two Wiltshire Horn Shearling Ewes.*

2202 I.—W. B. Southernwood, Gubblecote, Tring.
2201 II.—A. Gowling, Snowford Hall, Leamington Spa.
2198 III.—H. Atterbury, Sharley Cop, Ravensthorpe, Northampton.

Ryelands.

Class 263.—*Ryeland Rams, Two Shear and Upwards.*

2206 I.—David J. Thomas, Monachty, Abergavenny, for Thomas' O.K. 3002, born in 1931.
2205 II.—T. W. Montague Perkins, Ufton Court, Holme Lacy, Hereford, for Berrington Juror 2486, born in 1930, bred by Lord Cawley, Berrington Hall, Leominster.
2204 III.—Herbert N. Moore, Priors Court, Mordiford, Hereford, for Berrington Kernal 2837, born in 1931, bred by Lord Cawley, Berrington Hall, Leominster.

Class 264.—*Ryeland Shearling Rams.*

2209 I. & Champion.[3]—Herbert N. Moore, Priors Court, Mordiford, Hereford, for Priors Don.
2212 II. & R.N. for Champion.[3]—David J. Thomas, Monachty, Abergavenny, for Thomas' Patent.
2208 III.—W. L. Horbury, Ettington Park, Stratford-on-Avon, for Ettington Gradus.
2207 R.N.—W. L. Horbury, for Ettington Glory.
H.C.—2211.

Class 265.—*Three Ryeland Ram Lambs.*

2216 I.—T. W. Montague Perkins, Ufton Court, Holme Lacy, Hereford.
2214 II.—W. L. Horbury, Ettington Park, Stratford-on-Avon.
2217 III.—David J. Thomas, Monachty, Abergavenny.
2215 R.N.—Herbert N. Moore, Priors Court, Mordiford, Hereford.

Class 266.—*Three Ryeland Shearling Ewes.*

2221 I., and 2222 III.—T. W. Montague Perkins, Ufton Court, Holme Lacy, Hereford.
2220 II.—Herbert N. Moore, Priors Court, Mordiford, Hereford.
2218 R.N.—W. L. Horbury, Ettington Park, Stratford-on-Avon.

Class 267.—*Three Ryeland Ewe Lambs.*

2226 I.—T. W. Montague Perkins, Ufton Court, Holme Lacy, Hereford.
2225 II.—Herbert N. Moore, Priors Court, Mordiford, Hereford.
2224 III.—W. L. Horbury, Ettington Park, Stratford-on-Avon.
2223 R.N.—Lord Cawley, Berrington Hall, Leominster.

Kerry Hills (Wales).

Class 268.—*Kerry Hill (Wales) Rams, Two Shear and Upwards.*

2227 I.—John T. Beavan, Winsbury, Chirbury, Montgomery, for Jamesford Namesake 16891, born in 1931, bred by P. T. Pugh, Jamesford, Montgomery.
2230 II.—The Hon. Mrs. Esmé Smyth, Ashton Court, Long Ashton, Bristol, for Winsbury Nero, 17313, born in 1931, bred by J. T. Beavan, Winsbury, Chirbury; *s.* Broadheath Monarch 14902, *d. by* Jamesford Goalkeeper 10293.
2231 III.—The Duke of Westminster, G.C.V.O., D.S.O., Eaton Home Farm, Aldford, Chester, for Eaton Vulcan 15926, born in 1930.

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[1] Prizes given by the Wiltshire Horn Sheep Society.

[2] Silver Challenge Cup given by the Wiltshire Horn Sheep Society for the best exhibit.

[3] Silver Challenge Cup given through the Ryeland Flock Book Society for the best Shearling Ram.

Class 269.—*Kerry Hill (Wales) Shearling Rams.*

2233 **I. & R.N. for Champion.**[1]—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery, for **Winsbury Oberon 17803.**
2238 **II.**—J. W. OWENS, Woodhouse, Shobdon, Herefordshire, for **Stockley Perfect 17697.**
2240 **III.**—THE DUKE OF WESTMINSTER, G.C.V.O., D.S.O., Eaton Home Farm, Aldford, Chester, for **Eaton Yoyo 17433.**
2237 **R.N.**—J. W. OWENS, for **Stockley Peach.**

Class 270.—*Kerry Hill (Wales) Ram Lambs.*

2246 **I.**—J. W. OWENS, Woodhouse, Shobdon, Herefordshire, for **Stockley Quaker.**
2248 **II.**—H. C. PILKINGTON, Bryntanat, Llansantffraid, Mont., for **Tanatside Merriman.**
2247 **III.**—J. W. OWENS, for **Stockley Quibbler.**
2242 **IV.**—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery.
2252 **R.N.**—THOMAS WILLIAMS, The Gaer, Forden, Welshpool, for **Gaer Onward.**

Class 271.—*Three Kerry Hill (Wales) Shearling Ewes.*

2253 **I. & Champion.**[1]—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery.
2255 **II.**—J. W. OWENS, Woodhouse, Shobdon, Herefordshire.
2259 **III.**—THE DUKE OF WESTMINSTER, G.C.V.O., D.S.O., Eaton Home Farm, Aldford, Chester.
2254 **R.N.**—L. LITHGOW, Manor Farm, Shawell, Rugby.

Class 272.—*Three Kerry Hill (Wales) Ewe Lambs.*[2]

2261 **I.**—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery.
2264 **II.**—J. W. OWENS, Woodhouse, Shobdon, Herefordshire.
2262 **III.**—J. N. KENDALL, Brimpsfield Park, Glos.
2267 **R.N.**—THOMAS WILLIAMS, The Gaer, Forden, Welshpool.

Clun Forest.

Class 273.—*Clun Forest Rams, Shearling and Upwards.*

2268 **I.**—W. R. LYKE, Lawton Bury, Leominster, for **Edingale Firefly 2025,** born in 1931, bred by E. J. Holland, Edingale House, Tamworth.
2271 **II.**—D. POWELL, Lower Kimbolton, Leominster, for **Brock Gem,** born in 1930, bred by Col. Lutley, Brockhampton, Bromyard.
2270 **III.**—MORGAN MORGAN, Lower Letton, Bucknell, Shropshire, for **Letton Ideal,** born in 1932; *s.* Kimbolton Bonny Boy 2105, *d. by* Seifton Future 1517.
2269 **R.N.**—H. JOHN MARSH, Bedstone, Bucknell, Shropshire, for **Bedstone Imp.**

Class 274.—*Three Clun Forest Shearling Ewes.*[3]

2272 **I.,** and 2273 **III.**—H. JOHN MARSH, Bedstone, Bucknell, Shropshire.
2274 **II.**—MRS. DOROTHY M. B. SPEAKMAN, Stagbatch House, Leominster.

Lincolns.

Class 275.—*Lincoln Two Shear Rams.*

2277 **I. & R.N. for Champion.**[4]—D. F. BROWETT, Thornton House, Thornton, Horncastle, for **Thornton Perfection 18841,** bred by Major W. H. Rawnsley, Well Vale, Alford.
2275 **II.**—ERNEST ADDISON, Riby Grange, Stallingboro', Lincs., for **Riby Royal Winner.**
2276 **III.**—D. F. BROWETT, for **Thornton Challenger 18840,** bred by Major W. H. Rawnsley, Well Vale, Alford.

Class 276.—*Lincoln Shearling Rams.*

2278 **I. & Champion.**[4]—ERNEST ADDISON, Riby Grange, Stallingboro', Lincs.
2281 **II.**—CLIFFORD NICHOLSON, Willoughton Manor, Lincoln.
2279 **III.**—D. F. BROWETT, Thornton House, Thornton, Horncastle, for ram, bred by Major W. H. Rawnsley, Well Vale, Alford.

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[1] Silver Challenge Cup given through the Kerry Hill (Wales) Flock Book Society for the best exhibit.

[2] Prizes given by the Kerry Hill (Wales) Flock Book Society.

[3] Prizes given by the Clun Forest Sheep Breeders' Association.

[4] Champion Prize of £5 given by the Lincoln Longwool Sheep Breeders' Association for the best Ram in Classes 275 and 276.

Class 277.—*Three Lincoln Shearling Rams.*

2286 I.—Clifford Nicholson, Willoughton Manor, Lincoln.
2282 II.—Ernest Addison, Riby Grange, Stallingboro', Lincs.
2284 III.—D. F. Browett, Thornton House, Thornton, Horncastle, for ram, bred by Major W. H. Rawnsley, Well Vale, Alford.

Class 278.—*Three Lincoln Ram Lambs.*

2287 I.—Ernest Addison, Riby Grange, Stallingboro', Lincs.
2289 II.—Francis Carbutt, Rothwell, Caistor, Lincs.
2288 III.—D. F. Browett, Thornton House, Thornton, Horncastle.

Class 279.—*Three Lincoln Ewe Lambs.*

2290 I.—Ernest Addison, Riby Grange, Stallingboro', Lincs.
2291 II.—D. F. Browett, Thornton House, Thornton, Horncastle.
2292 III.—Francis Carbutt, Rothwell, Caistor, Lincs.

Leicesters.

Class 280.—*Leicester Shearling Rams.*

2295 **I. & Champion.**[1]—R. Megginson, Garton Field, Driffield.
2294 **II.& R.N. for Champion.**[1]—William Jordan, Eastburn, Driffield.
2293 III.—F. W. Dennis, 43 Aberdeen Walk, Scarborough, for **Crossgates Statesman.**

Class 281.—*Leicester Ram Lambs.*

2296 I.—F. W. Dennis, 43, Aberdeen Walk, Scarborough, for **Crossgates Victor.**
2298 II.—R. Megginson, Garton Field, Driffield.
2297 III.—William Jordan, Eastburn, Driffield.

Class 282.—*Leicester Shearling Ewes.*

2301 I.—R. Megginson, Garton Field, Driffield.
2300 II.—William Jordan, Eastburn, Driffield.
2299 III.—F. W. Dennis, 43, Aberdeen Walk, Scarborough.

Class 283.—*Leicester Ewe Lambs.*

2303 I.—William Jordan, Eastburn, Driffield.
2302 II.—F. W. Dennis, 43, Aberdeen Walk, Scarborough.
2304 III.—R. Megginson, Garton Field, Driffield.

Border Leicesters.

Class 284.—*Border Leicester Rams, Two Shear and Upwards.*

2308 **I. & Champion.**[2]—James Howie & Sons, Muirside, Dumfries, for **Noonday Sun,** born in 1931, bred by A. B. Howie, Eshott Brocks, Felton.
2305 II.—R. C. Cameron, Greenlawdean, Berwickshire, for **Sandyknowe Piecemaster** 8988, born in 1929, bred by T. & M. Templeton, Sandyknowe, Kelso.
2310 III.—Robert Wilson, Dockrayrigg, Wigton, for **Bogardo Silver,** born in 1931, bred by James Findlay, Bogardo.
H.C.—2309.

Class 285.—*Border Leicester Shearling Rams.*

2316 I.—A. B. Howie, Eshott Brocks, Felton, Morpeth.
2315 II.—Robert Cross, Knockdon, Maybole.
2313 III.—Robert Cross, for **Bonnie Briar** 9440, bred by Geo. McDowall, Briarbrae, Stranraer.
H.C.—2311, 2312, 2317.

Class 286.—*Border Leicester Ewes, Two Shear and Upwards.*[3]

2321 **I. & R.N. for Champion.**[2]—A. B. Howie, Eshott Brocks, Felton, Morpeth, for ewe born in 1931.
2319 II.—R. C. Cameron, Greenlawdean, Berwickshire, for ewe born in 1930, bred by Alexander Brown, Sandyknowe, Kelso.
2320 III.—Robert Cross, Knockdon, Maybole, for ewe born in 1930.
H.C.—2323.

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[1] Champion Prize of a Piece of Plate given by the Leicester Sheep Breeders' Association for the best exhibit.

[2] Perpetual Silver Challenge Cup given by the Society of Border Leicester Sheep Breeders for the best Ram or Ewe.

[3] Prizes given by the Society of Border Leicester Sheep Breeders.

Class 287.—*Border Leicester Shearling Ewes.*

2330 I.—James Howie & Sons, Muirside, Dumfries, bred by A. B. Howie, Eshott Brocks' Felton, Morpeth.
2325 II.—Alexander Cochrane, Nether Craig, Kilmarnock, bred by George McCaig, Low Balcray, Whithorn.
2328 III.—A. B. Howie, Eshott Brocks, Felton, Morpeth.
H.C.—2324, 2327.

Wensleydales.

Class 288.—*Wensleydale Rams, Two Shear and Upwards.*

2333 I.—John Wm. Greensit, Holme-on-Swale, Thirsk, for **Carperby Cavalier 3940**, born in 1931, bred by John A. Willis, Manor House, Carperby, Yorks.
2336 II.—J. B. Smalley, Birkby Hall, Cark-in-Cartmel, Carnforth, for **Burneside What's Wanted 3939**, born in 1931, bred by John Dargue, Burneside Hall, Kendal.
2332 III.—John Dargue, Burneside Hall, Kendal, for **Carperby Fashion 2nd 3941**, born in 1931, bred by John A. Willis, Manor House, Carperby, Yorks.
C.—2334.

Class 289.—*Wensleydale Shearling Rams.*

2337 I. & Champion.[1]—John Dargue, Burneside Hall, Kendal, for **Burneside Commander.**
2338 II.—John Dargue, for **Burneside Prince Lovely**, bred by R. H. Milner, Borwick Lodge, Carnforth.
2339 III.—John Wm. Greensit, Holme-on-Swale, Thirsk, for ram, bred by John Dinsdale, Low Bolton, Redmire.
2343 R.N.—John A. Willis, Manor House, Carperby, Yorks.
C.—2341.

Class 290.—*Three Wensleydale Shearling Rams.*

2345 I.—John Dargue, Burneside Hall, Kendal.
2347 II.—John Percival, Easthouse, Carperby, Yorks., for rams, bred by John Hargreaves, Wath, Ripon.
2346 III.—John Wm. Greensit, Holme-on-Swale, Thirsk.
2348 R.N.—J. B. Smalley, Birkby Hall, Cark-in-Cartmel, Carnforth, for rams, bred by C. Nettleton, Bishop Wilton, York.

Class 291.—*Wensleydale Shearling Ewes.*

2354 I.—John A. Willis, Manor House, Carperby, Yorks.
2350 II.—John Wm. Greensit, Holme-on-Swale, Thirsk.
2355 III.—John A. Willis, for ewe, bred by John Allison & Sons, Howgrave Hall, Bedale.
2349 R.N.—John Dargue, Burneside Hall, Kendal.

Class 292.—*Wensleydale Yearling Ewes, shown in Wool.*[2]

2360 I. & R.N. for Champion.[1]—John A. Willis, Manor House, Carperby, Yorks.
2357 II.—John Percival, Easthouse, Carperby, Yorks.
2356 III.—John Wm. Greensit, Holme-on-Swale, Thirsk.
2358 R.N.—J. B. Smalley, Birkby Hall, Cark-in-Cartmel, Carnforth.

Kent or Romney Marsh.

Class 293.—*Kent or Romney Marsh Two Shear Rams.*

2361 I.—J. Egerton Quested, The Firs, Cheriton, Kent, for **Quested's No. 4 of 1931 74275.**
2362 II.—J. Egerton Quested, for **Quested's No. 145 of 1931 74344.**

Class 294.—*Kent or Romney Marsh Shearling Rams.*

2364 I. & Champion.[3]—E. W. Baker, Parsonage Farm, Bekesbourne, Canterbury.
2371 II. & R.N. for Champion.[3]—Ashley Stevens, Davington Hall, Faversham.
2369 III.—J. Egerton Quested, The Firs, Cheriton, Kent.
2365 R.N.—William Miller, Renville, Canterbury.
H.C.—2370. C.—2366.

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[1] Silver Challenge Trophy given by the Wensleydale Longwool Sheep Breeders' Association for the best exhibit.

[2] Prizes given by the Wensleydale Longwool Sheep Breeders' Association.

[3] Champion Prize of £10 10*s*. given by the Kent or Romney Marsh Sheep Breeders' Association for the best Ram in Classes 293 and 294.

Class 295.—*Three Kent or Romney Marsh Shearling Rams.*[1]

2373 I. £20.—E. W. BAKER, Parsonage Farm, Bekesbourne, Canterbury.
2379 II. £15.—J. EGERTON QUESTED, The Firs, Cheriton, Kent.
2380 III. £10 and 2381 R.N.—ASHLEY STEVENS, Davington Hall, Faversham.
2374 IV. £5.—WILLIAM MILLER, Renville, Canterbury.
H.C.—2378. C.—2375.

Class 296.—*Three Kent or Romney Marsh Ram Lambs.*

2384 I. and 2383 III.—CLIFFORD NICHOLSON, Willoughton Manor, Lincoln.
2385 II. and 2386 R.N.—J. EGERTON QUESTED, The Firs, Cheriton, Kent.

Class 297.—*Three Kent or Romney Marsh Shearling Ewes.*

2389 I. and 2390 II.—J. EGERTON QUESTED, The Firs, Cheriton, Kent.
2388 III. and 2387 R.N.—CLIFFORD NICHOLSON, Willoughton Manor, Lincoln.

Class 298.—*Three Kent or Romney Marsh Ewe Lambs.*

2393 I. & Champion[2] and 2392 III.—CLIFFORD NICHOLSON, Willoughton Manor, Lincoln.
2395 II. & R.N. for Champion[2] and 2394 R.N.—J. EGERTON QUESTED, The Firs, Cheriton, Kent.

Devon Close Wools.

Class 299.—*Devon Close Wool Rams, Shearling and Upwards.*

2396 I.—F. R. FRY, Wigmore Farm, East Down, Barnstaple, for ram born in 1932.
2398 II. and 2397 III.—A. R. LERWILL, Maddox Down, East Down, Barnstaple, for rams, born in 1932.

Class 300.—*Devon Close Wool Shearling Ewes.*

2401 I. and 2400 II.—A. R. LERWILL, Maddox Down, East Down, Barnstaple.
2399 III.—F. R. FRY, Wigmore Farm, East Down, Barnstaple.

South Devons.

Class 301.—*South Devon Shearling Rams.*

2402 I. and 2403 II.—W. C. BICE & SON, Nanswhyden, St. Columb, Cornwall.
2404 III.—WILLIAM HAWKE, Besoughan, Colan, St. Columb, Cornwall.

Class 302.—*South Devon Shearling Ewes, shown in Wool.*

2406 I. and 2405 II.—J. N. GROSE, Penare, Gorran, Cornwall.
2407 III.—WILLIAM HAWKE, Besoughan, Colan, St. Columb, Cornwall.

Dartmoors.

Class 303.—*Dartmoor Rams, Shearling and Upwards.*

2413 I.—R. P. LUCE, Lower Chaddlehanger, Tavistock, for **Chaddlehanger Jovial**, born in 1932.
2408 II.—J. E. DAWE & SONS, Burns Hall, Lewdown, Devon, for **Uppaton Cambric 4836**, born in 1931, bred by R. S. Luscombe, Uppaton, Cornwood.
2411 III.—F. A. JOHNS, Cleave, Kelly, Lifton, Devon, for **Cleave No. 315 4669**, born in 1931.
2412 R.N.—R. P. LUCE for **Sherford No. 4.**

Class 304.—*Dartmoor Shearling Ewes.*

2418 I.—R. P. LUCE, Lower Chaddlehanger, Tavistock.
2417 II.—J. KNAPMAN & SON, Thorne, Throwleigh, Okehampton.
2416 III.—GEORGE GLANFIELD, West Lake, Okehampton, for ewes bred by J. Knapman & Son, Thorne, Throwleigh, Okehampton.
2415 R.N.—G. H. EUSTICE, Bezurrell, Gwinear, Hayle.

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[1] Prizes given by the Kent or Romney Marsh Sheep Breeders' Association.

[2] Champion Prize of £10 10s. given by the Kent or Romney Marsh Sheep Breeders' Association for the best Pen of Ewes or Ewe Lambs.

Derbyshire Gritstones.

Class 305.—*Derbyshire Gritstone Rams, Shearling and Upwards.*

2421 I.—William Kelsall, Low Pleasant Farm, Quernmore, Lancaster, for **Pleasant Hero**, born in 1931.
2423 II.—Sam Moorhouse, Martinnest Poultry Farm, Meltham, Huddersfield, for **Helme Stamp No. 315**, born in 1931, bred by John Dixon, Rowton Farm, Helme, Meltham, Huddersfield.
2422 III.—Capt. the Hon. Richard W. D. Legh, Lyme Park, Disley, Cheshire, for **Lyme Star**, born in 1931.

Class 306.—*Derbyshire Gritstone Shearling Ewes.*

2426 I.—William Kelsall, Low Pleasant Farm, Quernmore, Lancaster, for **Pleasant No. 101.**
2427 II.—William Kelsall, for **Pleasant No. 103.**
2424 III.—John Dixon, Rowton Farm, Helme, Meltham, Huddersfield.
2425 R.N.—Charles Eyre, Beet Farm, Chapel-en-le-Frith, for **Beet Ruby.**

Swaledales.

Class 309.—*Swaledale Rams, Two Shear and Upwards.*[1]

2430 I. & Champion.[2]—Sir Frederick Milbank, Bart., Barmingham Park, Richmond, Yorks., for **East Stonesdale Ruby**, born in 1931, bred by J. N. Harker & Son, East Stonesdale, Keld, Richmond.
2431 II.—J. L. Peacock, Punchard House, Arkengarthdale, Richmond, Yorks., for **Punchard Snowball**, born in 1931.
2429 III.—Joseph William Dent, Fair View, Middleton-in-Teesdale, for **Cronkley Comet A. 1691**, born in 1930, bred by Matthew W. Peacock, Blake House, Lunedale.

Class 310.—*Swaledale Shearling Rams.*

2435 I. & R.N. for Champion.[2]—J. L. Peacock, Punchard House, Arkengarthdale, Richmond, Yorks., for **Punchard Style.**
2432 II.—Joseph William Dent, Fair View, Middleton-in-Teesdale, for **Woolley Humble.**
2434 III.—Sir Frederick Milbank, Bart., Barmingham Park, Richmond, Yorks., for **Milbank Heather Boy.**

Class 311.—*Swaledale Ewes, Two Shear and Upwards.*

2436 I.—Joseph William Dent, Fair View, Middleton-in-Teesdale, for ewe born in 1928.
2438 II.—J. L. Peacock, Punchard House, Arkengarthdale, Richmond, Yorks., for **Punchard Beauty**, born in 1930.
2437 III.—Sir Frederick Milbank, Bart., Barmingham Park, Richmond, Yorks., for ewe born in 1929.

Class 312.—*Swaledale Shearling Ewes.*

2439 I. and 2440 II.—Joseph William Dent, Fair View, Middleton-in-Teesdale.
2441 III.—Sir Frederick Milbank, Bart., Barmingham Park, Richmond, Yorks.

Herdwicks.

Class 313.—*Herdwick Rams, any age.*

2445 I.—William Wilson, Herdwick View, Armathwaite Hall, Keswick, for **Derwent Long Ago 5896**, born in 1926.
2443 II.—John F. Palmer, Darling How Farm, Cockermouth, for **Harrot Vulcan 6608**, born in 1929, bred by William Rigg, Hill Park, Greenodd, Lancs.
2444 III.—S. D. Stanley-Dodgson, Armaside, Cockermouth, for **Harrot Makeshift**, born in 1931.

Class 314.—*Herdwick Ewes, any age.*

2449 I.—William Wilson, Herdwick View, Armathwaite Hall, Keswick, for **Derwent White Rose 825**, born in 1932.
2447 II.—S. D. Stanley-Dodgson, Armaside, Cockermouth, for ewe born in 1932.
2448 III.—William Wilson, for **Derwent Red Rose 329**, born in 1932.
2446 R.N.—John F. Palmer, Darling How Farm, Cockermouth.

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[1] Prizes given by the Swaledale Sheep Breeders' Association.

[2] Champion Prize of £5 given by the Swaledale Sheep Breeders' Association for the best exhibit.

Welsh Mountain.

Class 317.—*Welsh Mountain Rams, Shearling and Upwards.*

2453 I.—University College of North Wales, College Farm, Aber, Caernarvonshire, for **Tynycae C. 5 3879**, born in 1930, bred by J. T. Lewis, Tynycae, Llanrhaiadr, Oswestry.

2450 II.—Llysfasi Farm Institute, Ruthin, North Wales, for **Edeyrn A. 3 3114**, born in 1928.

2454 III.—University College of North Wales, for **Vivod C. 6 3716**, born in 1930, bred by Capt. W. Best, Vivod, Llangollen.

2452 R.N.—Major Eric J. W. Platt, Madryn Farm, Aber, Caernarvonshire, for **Bwlch D. 3.**

Class 318.—*Three Welsh Mountain Shearling Ewes.*

2456 I. and 2455 R.N.—Llysfasi Farm Institute, Ruthin, North Wales.

2457 II.—Major Eric J. W. Platt, Madryn Farm, Aber, Caernarvonshire.

2459 III.—University College of North Wales, College Farm, Aber, Caernarvonshire.

Black Welsh Mountain.

Class 319.—*Black Welsh Mountain Shearling Rams.*

2464 I.—Mrs. Jervoise, Herriard Park, Basingstoke.

2462 II.—Mrs. Peter Clowes, Burton Court, Leominster.

Class 320.—*Three Black Welsh Mountain Shearling Ewes.*[1]

2469 I.—Mrs. Jervoise, Herriard Park, Basingstoke.

2465 II.—Major Clive Behrens, Swinton Grange, Malton.

2468 III.—Major F. H. T. Jervoise, Herriard Park, Basingstoke, for ewes, bred by Mrs. Jervoise, Herriard Park.

2467 R.N.—Mrs. Peter Clowes, Burton Court, Leominster.

PIGS.

The Prizes in each Class for Pigs are: First, £10; Second, £5; Third, £3; Fourth, £2; Fifth, £1.

[*The numbers in brackets refer to the Tattoo or Ear Numbers of the Animals.*]

Large Whites.

Class 321.—*Large White Boars, born in or before* 1931.

2475 I., Champion[2] & Champion.[3]—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Walton Boy 75th 78157 (2722)**, born Jan. 17, 1931; *s.* Walton Boy 39th 66159, *d.* Moreton May 10th 171354 *by* Bourne Baldwin 52255.

2485 II. & R.N. for Champion.[2]—H. W. White, Weston Hills, Spalding, for **Westacre Bradbury 583rd 81861 (5006)**, born July 17, 1931, bred by Alfred Lewis, Westacre, King's Lynn; *s.* Creek Bradbury 10th 71145, *d.* Weston Princess 197796 *by* Ramsey Reality 2nd 69751.

2483 III.—Walter W. Ryman, Wall, Lichfield, for **Wall Majestic 81651 (4087)**, born Feb. 20, 1931; *s.* Bourne King David 12th 40515, *d.* Wall Betty 20th 182486 *by* Wall Big Ben 10th 53825.

2471 IV.—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Boy 5th 80581 (856)**, born Jan. 6, 1931; *s.* Aldenham Bonetta's Boy 68101, *d.* Histon Belle 224th 195036 *by* Spalding Bob 9th 53618.

2478 R.N.—Rowland P. Haynes, Delves Green Farm, Walsall, for **Caldmore King David 29th.**

H.C.—2479. C.—2481, 2486.

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[1] Prizes given by the Black Welsh Mountain Sheep Breeders' Association.

[2] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Large White Boar.

[3] Silver Challenge Cup given by the National Pig Breeders' Association for the best Large White Pig.

2475, 2501, 2556, 2595 **Special I.**[1]—Lord Daresbury, C.V.O., for **Walton Boy 75th, Walton Boy 98th, Walton Mary 27th and Walton Catalina 13th.**
2483, 2564, 2583, 2606 **Special II.**[1]—Walter W. Ryman, for **Wall Majestic, Wall Beautiful 11th, Wall Champion Queen 18th and Wall Champion Queen 15th.**
2495, 2570, 5872, 2638 **R.N. for Specials.**[1]—W. White & Son, for **Taunton Bradbury 29th, Taunton East Lass 8th, Taunton East Lass 16th and Taunton Champion Bonetta 11th.**

Class 322.—*Large White Boars, born in* 1932, *before July* 1.

2495 **I.**—W. White & Son, Pool Farm, Taunton, for **Taunton Bradbury 29th** (465), born Jan. 7; *s.* Fen Bradbury 10th 60773, *d.* Taunton East Lass 8th 197208 *by* Dunston Delegate 18th 52719.
2487 **II.**—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Walton Bandmaster 62nd** 81691 (3234), born Jan. 10; *s.* Handley Bandmaster 7th 71803, *d.* Walton Lady 12th 208160 *by* Kirby Bedon Monitor 30th 69385.
2488 **III.**—Lord Daresbury, C.V.O., for **Walton Hercules 31st** (3275), born Jan. 20; *s.* Walton Hercules 14th 78197, *d.* Walton May 6th 208206 *by* Walton Boy 39th 66159.
2494 **R.N.**—Walter W. Ryman, Wall, Lichfield, for **Wall Candidate 3rd.**
H.C.—2489.

Class 323.—*Large White Boars, born in* 1932, *on or after July* 1.[2]

2501 **I.**—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Walton Boy 98th** (3473), born July 1; *s.* Walton Boy 39th 66159, *d.* Walton Queen Mary 7th 173376 *by* Dupplin Excellence 56389.
2514 **II.**—Alfred W. White, Hillegom, Spalding, for **Spalding Bradbury 25th** (2224), born July 12; s. Aldenham Bradbury 9th 70629, *d.* Spalding Lady Mollington 43rd 207286 *by* Duston Monitor 23rd 60619.
2511 **III.**—Walter W. Ryman, Wall, Lichfield, for **Wall Jay 113th** (5588), born July 2; *s.* Wall Jay 27th 66101, *d.* Wall Queen Anne 9th 197540 *by* Wall Jay 14th 62425.
2507 **IV.**—Alfred Lewis, Westacre, King's Lynn, for **Westacre Bradbury 790th** (5634) born Aug. 6; *s.* Creek Bradbury 10th 71145, *d.* Amcotts Reine 3rd 192794 *by* Westacre Bradbury 293rd 70301.
2506 **V.**—Ernest Harding, Packwood Grange, Dorridge, Birmingham, for **Packwood Recorder 10th** (4001), born July 1; *s.* Packwood Recorder 80967, *d.* Wall Betty 32nd 208010 *by* Bourne King David 12th 40515.
2513 **R.N.**—H. D. Salisbury, Knipton, Grantham, for **Knipton Knight.**
H.C.—2516. **C.**—2500.

Class 324.—*Large White Boars, born in* 1933.

2547 **I.**—Alfred W. White, Hillegom, Spalding, for **Spalding Bradbury 26th** (3008), born Jan. 3; *s.* Aldenham Bradbury 9th 70629, *d.* Spalding Baroness 10th 191118 *by* Duston Monitor 23rd 60619.
2549 **II.**—Alfred W. White, for **Spalding Bradbury 28th** (3011), born Jan. 3; *s.* Aldenham Bradbury 9th 70629, *d.* Spalding Baroness 10th 191118 *by* Duston Monitor 23rd 60619.
2551 **III.**—W. White & Son, Pool Farm, Taunton, for **Taunton Bradbury 31st** (687), born Jan. 2; *s.* Taunton Bradbury 29th (465), *d.* Taunton Champion Bonetta 3rd 197204 *by* Duston Delegate 18th 52719.
2523 **IV.**—D. R. Daybell & Son, Bottesford, Nottingham, for **Bottesford Boy 27th** (417), born Jan. 6; *s.* Walton Boy 42nd 73357, *d.* Bottesford Buttercup 107th 178862 *by* Edmonton Bradbury 3rd 56491.
2521 **V.**—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Walton Bandmaster 90th** (3672), born Jan. 3; *s.* Handley Bandmaster 7th 71803, *d.* March Belle 8th 195678 *by* Westacre Bradbury 252nd 70279.
2550 **R.N.**—H. W. White, Weston Hills, Spalding, for **Weston Bradbury 8th.**
H.C.—2532. **C.**—2530, 2533, 2536, 2537, 2539, 2545, 2546.

Class 325.—*Large White Breeding Sows, born in or before* 1931.

2563 **I. & R.N. for Champion.**[3]—John Pierpont Morgan, Wall Hall, Watford, for **Aldenham Lady Mollington 18th** 208000 (3876), born Feb. 8, 1930, farrowed Feb. 22; *s.* Aldenham Boy 55665, *d.* Aldenham Lady Mollington 11th 167438 *by* Aldenham Bellringer 13th 39917.
2570 **II.**—W. White & Son, Pool Farm, Taunton, for **Taunton East Lass 8th** 197208 (1658), born Jan. 3, 1929, farrowed Feb. 12; *s.* Duston Delegate 18th 52719, *d.* Histon East Lass 11th 147038 *by* Histon Wonder 33677.

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[1] Special Prizes of a Cup or £10 cash (First Prize) and £5 (Second Prize) given by the National Pig Breeders' Association for the best groups of four Pigs, bred by Exhibitor. One Boar (at least) had to be included in each group, and not more than one entry selected from any one Class.

[2] Prizes, except Fourth and Fifth, given by the National Pig Breeders' Association.

[3] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Large White Sow.

2556 III.—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Walton Mary 27th** 197666 (2285), born Feb. 4, 1930, farrowed Feb. 2; *s.* Walton King David 55th 70223, *d.* Peakirk Mary 5th 160130 *by* Bob of Bourne 28701.

2564 IV.—Walter W. Ryman, Wall, Lichfield, for **Wall Beautiful 11th** 191626 (1955), born July 24, 1928, farrowed Jan. 9; *s.* Bourne King David 12th 40515, *d.* Wall Beautiful 161426 *by* Hallastone Premier 18th 48089.

2559 V.—Rowland P. Haynes, Delves Green Farm, Walsall, for **Caldmore C. Bashful Lady** 212112, born May 20, 1930, farrowed Feb. 4; *s.* Wall King David 9th 70085, *d.* Cutthorpe Bashful Lady 24th 145958 *by* Jay of Cutthorpe 37223.

2562 R.N.—John Pierpont Morgan, for **Aldenham Dainty Girl 10th.**

H.C.—2569. C.—2555, 2560.

Class 326.—*Large White Sows, born in* 1932, *before July* 1.

2583 **I., R.N. for Champion[1] & Champion.[2]**—Walter W. Ryman, Wall, Lichfield, for **Wall Champion Queen 18th** (5435), born March 5; *s.* Wall Candidate 78031, *d.* Wall Champion Queen 9th 208026 *by* Wall Jay 27th 66101.

2573 II.—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Hallastone Belle 20th** (2878), born Jan. 30, bred by W. Hallas, Bank House Farm, Helsby, Warrington; *s.* Gogar Macbeth 7th 71663, *d.* Hallastone Belle 17th 194782 *by* Wentworth Bradbury 29th 62597.

2581 III.—John Pierpont Morgan, Wall Hall, Watford, for **Aldenham Queen 76th** 211104 (5084), born Jan. 21; *s.* Histon Basil 2nd 69129, *d.* Aldenham Queen 51st 192706 *by* Histon King David 29th 65247.

2574 IV.—Lord Daresbury, C.V.O., for **Walton Mary 59th** (3255), born Jan. 14; *s.* Walton Boy 39th 66159, *d.* Walton Mary 19th 197650 *by* Adlington Hercules 3rd 59901.

2584 V.—Walter W. Ryman, for **Wall Champion Queen 19th** (5433), born March 5; *s.* Wall Candidate 78031, *d.* Wall Champion Queen 9th 208026 *by* Wall Jay 27th 66101.

2587 R.N.—W. White & Son, Pool Farm, Taunton, for **Taunton East Lass 16th.**

H.C.—2571, 2586. C.—2577, 2585.

Class 327.—*Large White Sows, born in* 1932, *on or after July* 1.

2595 I.—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Walton Catalina 13th** (3481), born July 1; *s.* Handley Bandmaster 7th 71808, *d.* Wall Catalina 26th 191664 *by* Bourne King David 12th 40515.

2597 II.—D. R. Daybell & Son, Bottesford, Nottingham, for **Bottesford Buttercup 180th** (374), born July 5; *s.* Walton Boy 42nd 73357, *d.* Bottesford Buttercup 124th 188272 *by* Edmonton Bradbury 3rd 56491.

2602 III.—Alfred Lewis, Westacre, King's Lynn, for **Westacre Belle 142nd** (5499), born July 3; *s.* Creek Premier 76087, *d.* Creek Belle 51st 204202 *by* Westacre Bradbury 206th 70267.

2591 IV.—Mr. and Mrs. S. T. Brunt, Manor House, Bexley, Kent, for **Crayvalley Bonetta 5th** (244), born July 1; *s.* Wall Achilles (81583), *d.* Crayvalley Bonetta 2nd 204174 *by* Woodborough Bradbury 10th 70433.

2600 V.—Ernest Harding, Packwood Grange, Dorridge, Birmingham, for **Packwood Blackberry 8th** (4024), born July 3; *s.* Glebe Rock Sand 71615, *d.* Packwood Blackberry 5th 214760 *by* Packwood Bob 15th 77829.

2593 R.N.—Ernest A. Crookes, Rose Cottage Farm, Cutthorpe, Chesterfield, for **Cutthorpe Queen 94th.**

H.C.—2596, 2606. C.—2594, 2605.

Class 328.—*Large White Sows, born in* 1933.

2635 I.—Alfred W. White, Hillegom, Spalding, for **Spalding Baroness 25th** (8013) born Jan. 3; *s.* Aldenham Bradbury 9th 70629, *d.* Spalding Baroness 10th 19118, *by* Duston Monitor 23rd 60619.

2632 II.—Lt.-Col. H. J. Stibbard, O.B.E., Chisledon Camp, Wiltshire, for **Vocational Butterfly 4th** (220), born Jan. 6; *s.* Wall Jay 82nd 78049, *d.* Woodborough Butterfly 4th 216900 *by* Woodborough Jay 4th 70441.

2617 III.—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Walton Belle 36th** (3677), born Jan. 3; *s.* Handley Bandmaster 7th 71808, *d.* Marche Belle 8th 195678, *by* Westacre Bradbury 252nd 70279.

2638 IV.—W. White & Son, Pool Farm, Taunton, for **Taunton Champion Bonetta 11th** (695), born Jan. 2; *s.* Taunton Bradbury 29th, *d.* Taunton Champion Bonetta 3rd 197204 *by* Duston Delegate 18th 52719.

2616 V.—Lord Daresbury, C.V.O., for **Walton Belle 35th** (3676), born Jan. 3; *s.* Handley Bandmaster 7th 71808, *d.* March Belle 8th 195678 *by* Westacre Bradbury 252nd 70279.

2623 R.N.—John Pierpont Morgan, Wall Hall, Watford, for **Aldenham Dainty Girl 19th.**

C.—2614.

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[1] Silver Challenge Cup given by the National Pig Breeders' Association for the best Large White Pig.

[2] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Large White Sow.

Middle Whites.

Class 329.—*Middle White Boars, born in or before* 1931.

2642 **I., Champion**[1] **& Champion.**[2]—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Marmion 6th** 79067 (142), born July 27, 1931 ; *s.* Fordon Marmion 74061, *d.* Histon Rosebud 43rd 186808 *by* Hammonds Herald 44353.

2640 **II., R.N. for Champion**[1] **& R.N. for Champion.**[2]—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring, for **Pendley What's Wanted** 75205 (345), born July 1, 1930 ; *s.* Pendley Reveller 74417, *d.* Pendley Fuchsia 13th 200178 *by* Pendley Apache 67091.

2641 **III.**—Chivers & Sons, Ltd., for **Fordon Marmion** 74061 (34), born Feb. 1, 1929, bred by J. S. Hicks, High Fordon, Wold Newton, Driffield ; *s.* Fordon Dignity 2nd 67577, *d.* Wharfedale Marmoia 166874 *by* Wharfedale Sunstar 51699.

2646 **R.N.**—P. W. Hull, The Knowle, Hazelwood, Derby, for **Hazelwood Solon 2nd.**
H.C.—2639. **C.**—2643, 2644.

2642, 2650, 2699, 2713 **Special I.**[3]—Chivers & Sons, Ltd., for **Histon Marmion 6th, Histon Bold Boy 6th, Histon Hagar 36th** and **Histon Dorothy 8th.**

2639, 2694, 2711, 2730 **Special II.**[3]—Franklin Batchelor, for **Cooling Baron, Cooling Rosa 10th, Cooling Garland 22nd** and **Cooling Rosa 18th.**

2688, 2722, 2738, 2753 **R.N. for Specials**[3]—Capt. D. P. Lithgow, for **Newton Neptune, Newton Nightingale 3rd, Newton Fuchsia 2nd** and **Newton Princess 5th.**

Class 330.—*Middle White Boars, born in* 1932, *before July* 1.

2650 **I.**—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Bold Boy 6th** (212), born Jan. 1 ; *s.* Shawlands Bold Boy 67965, *d.* Histon Rosadora 61st 175902 *by* Bookham Durbar 54229.

2651 **II.**—Chivers & Sons, Ltd., for **Histon Marmion 13th** (222), born Jan. 20 ; *s.* Fordon Marmion 74061, *d.* Shawlands Choice Lady 21st 202500 *by* Shawlands Master Woodman 67983.

2654 **III.**—Hicks & Sons, Fordon, Wold Newton, Driffield, for **Fordon Martin 7th** 78973 (472), born Jan. 7 ; *s.* Amport Illuminator 6th 74663, *d.* Fordon Marion 199100 *by* Fordon Dignity 2nd 67577.

2656 **IV.**—Capt. D. P. Lithgow, South Newington Manor, Banbury, for **Newton Deliverance 3rd** (70), born March 14 ; *s.* Pendley Deliverance 7th 74889, *d.* Salts Choice 34th 185164 *by* Wharfedale Deliverance 32575.

2653 **R.N.**—T. H. Gladstone, Eastcote Grange, Hampton-in-Arden, for **Barston Prince 2nd.**
H.C.—2658. **C.**—2652.

Class 331.—*Middle White Boars, born in* 1932, *on or after July* 1.[4]

2661 **I.**—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring, for **Pendley Aristocrat** (580), born Aug. 21 ; *s.* Pendley Pirate 79207, *d.* Pendley Lady Choice 187326 *by* Whitehill Hasty 4th 59745.

2666 **II.**—William Watson Buckle, Old Lane Farm, Colton, Tadcaster, for **Fulford Clink 3rd** (208), born July 1, bred by Joseph Triffitt, Fulford, York ; *s.* Fulford Deliverance 3rd 74861, *d.* Wharfedale Wink 187720 *by* Wharfedale Clinker 51673.

2667 **III.**—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Bold Boy 7th** (362), born July 31 ; *s.* Shawlands Bold Boy 67965, *d.* Histon Hagar 36th 199490 *by* Hammonds Herald 44353.

2665 **IV.**—William Watson Buckle, for **Fulford Clink** (206), born July 1, bred by Joseph Triffitt, Fulford, York ; *s.* Fulford Deliverance 3rd 74861, *d.* Wharfedale Wink 187720 *by* Wharfedale Clinker 51673.

2670 **R.N.**—T. H. Gladstone, Eastcote Grange, Hampton-in-Arden, for **Barston Prince 3rd.**
H.C.—2676. **C.**—2671.

Class 332.—*Middle White Boars, born in* 1933.

2679 **I.**—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Marmion 14th** (440), born Jan. 3 ; *s.* Fordon Marmion 74061, *d.* Histon Rosebud 43rd 186808 *by* Hammonds Herald 44353.

2680 **II.**—Chivers & Sons, Ltd., for **Histon Marmion 15th** (442), born Jan. 3 ; *s.* Fordon Marmion 74061, *d.* Histon Rosebud 43rd 186808 *by* Hammonds Herald 44353.

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[1] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Middle White Boar.

[2] Silver Challenge Cup given by the National Pig Breeders' Association for the best Middle White Pig.

[3] Special Prizes of a Gold Medal or £5 cash (First Prize) and a Silver Medal (Second Prize) given by the National Pig Breeders' Association for the best groups of four Pigs, bred by Exhibitor. One Boar (at least) had to be included in each group, and not more than one entry selected from any one Class.

[4] Prizes, except Fourth, given by the National Pig Breeders' Association.

2686 III.—P. W. Hull, The Knowle, Hazelwood, Derby, for **Hazelwood Castor** (3854), born Feb. 2; *s.* Hazelwood Hercules 3rd 79029, *d.* Hazelwood Leda 2nd 201618 *by* Hazelwood Ulysses 66875.

2688 IV.—Capt. D. P. Lithgow, South Newington Manor, Banbury, for **Newton Neptune** (200), born Jan. 1; *s.* Newton Rebel, *d.* Steepness Choice 2nd 200568 *by* Salts Baron 63761.

2682 R.N.—Chivers & Sons, Ltd., for **Histon Marmion 17th.**
H.C.—2681. C.—2685.

Class 333.—*Middle White Breeding Sows, born in or before* 1931.

2705 I. & Champion.[1]—H. Neaverson, Scotts Farm, Glinton, Peterborough, for **Cooling Garland 12th** 209538 (354), born Sept. 2, 1930, farrowed March 1, bred by F. Batchelor, Cooling Court, Rochester; *s.* Wattle Knight 32nd 67321, *d.* Ifield Garland 184412 *by* Dartford Victor 54421.

2699 II.—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Hagar 36th** 199490 (435), born Jan. 7, 1929, farrowed Feb. 2; *s.* Hammonds Herald 44353, *d.* Lancefield Atbara 164346 *by* Pendley Don 2nd 55029.

2702 III.—John R. Horne-Payne, Crownfields, Kelvedon Hatch, Essex, for **Mistley Prosperity** 210356 (654), born Nov. 29, 1930, farrowed Jan. 3, bred by Gen. B. Atkinson, Mistley Hall, Manningtree; *s.* Mistley Knight 74331, *d.* Mistley Garland 142nd 184708 *by* Mistley Deceiver 50725.

2694 IV.—Franklin Batchelor, Cooling Court Farm, Cooling, Rochester, for **Cooling Rosa 10th** 201202, born Jan. 3, 1931, farrowed March 12; *s.* Amport Illustrious 73901, *d.* Wattle Sally 3rd 185676 *by* Kenil Oarsman 35279.

2708 R.N.—W. H. Winn-Jones, The Knoll, Sully, Glam., for **Sully Bettina.**
H.C.—2695. C.—2700.

Class 334.—*Middle White Sows. born in* 1932, *before July* 1.

2722 I. & R.N. for Champion.[1]—Capt. D. P. Lithgow, South Newington Manor, Banbury, for **Newton Nightingale 3rd** (48), born Jan. 24; *s.* Pendley Deliverance 7th 74389, *d.* Steepness Nightingale 2nd 200572 *by* Compton Khan 66711.

2711 II.—Franklin Batchelor, Cooling Court Farm, Cooling, Rochester, for **Cooling Garland 22nd** (840), born March 14; *s.* Colton Vanguard 74815, *d.* Ifield Garland 184412 *by* Dartford Victor 54425.

2723 III.—Leslie K. Osmond, Barnoldby-le-Beck, Grimsby, for **Histon Lady Holly 49th** (241), born Feb. 1, bred by Chivers & Sons, Ltd., Histon, Cambridge; *s.* Shawlands Bold Boy 67965, *d.* Hammonds Holly Bee 201528 *by* Oxney Delivery 67077.

2713 IV.—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Dorothy 8th** (287), born Jan. 31; *s.* Fordon Marmion 74061, *d.* Shawlands Miss Dorothy 55th 202542 *by* Shawlands Bold Boy 67965.

2716 V.—George Gee, Ely Grange, Frant, Sussex, for **Mayford Choice Heather** (1413), born May 1; *s.* Mayford Sultan 74307, *d.* Heatherbourne Heather 186684 *by* Burningfold Rover 2nd 63027.

2714 R.N.—J. Onslow Fane, Steventon Manor, Hants, for **Steventon Choice 7th.**
H.C.—2726. C.—2712, 2718, 2720.

Class 335.—*Middle White Sows, born in* 1932, *on or after July* 1.

2781 I.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring, for **Pendley Princess Royal** (594), born Aug. 20; *s.* Wharfedale Wimple 68053, *d.* Pendley Princess 14th 200208 *by* Salts Deliverance 8th 55145.

2738 II.—Capt. D. P. Lithgow, South Newington Manor, Banbury, for **Newton Fuchsia 2nd** (127), born July 6; *s.* Pendley Deliverance 7th 74389, *d.* Pendley Fuchsia 20th 202342 *by* Pendley Apollo 5th 74373.

2780 III.—Franklin Batchelor, Cooling Court Farm, Cooling, Rochester, for **Cooling Rosa 18th** (883), born July 14; *s.* Cooling Baron 74025, *d.* Wattle Sally 3rd 185676 *by* Kenil Oarsman 35279.

2742 IV.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Shawlands Dorothy 72nd** (82), born July 4, bred by Mr. and Mrs. E. W. Brooks, Shurbridge Farm, Sidlow, Reigate; *s.* Shawlands Bold Boy 40th 79245, *d.* Shawlands Dorothy 185258 *by* Hawthorn Sultan 15th 54669.

2736 R.N.—George Gee, Ely Grange, Frant, Sussex, for **Mayford Julia.**
H.C.—2743. C.—2735, 2737.

Class 336.—*Middle White Sows, born in* 1933.

2753 I.—Capt. D. P. Lithgow, South Newington Manor, Banbury, for **Newton Princess 5th** (247), born Jan. 5; *s.* Newton Rebel, *d.* Newton Princess 2nd *by* Pendley Deliverance 7th 74389.

2757 II.—Joseph Triffitt, Fulford, York, for **Fulford Wink** (240), born Jan. 6; *s.* Fulford Deliverance 3rd 74861, *d.* Wharfedale Wink 187720 *by* Wharfedale Clinker 51673.

2745 III.—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Rosebud 49th** (451), born Jan. 8; *s.* Fordon Marmion 74061, *d.* Histon Rosebud 43rd 186808 *by* Hammonds Herald 44353.

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[1] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Middle White Sow.

2756 IV.—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Wratting Alsacia 3rd** (668), born Jan. 24; *s.* Wratting Deliverance 74647, *d.* Wratting Alsacia 2nd 210960 *by* Histon Apollo 66889.

2746 V.—CHIVERS & SONS, LTD., for **Histon Rosebud 50th** (453), born Jan. 3; *s.* Fordon Marmion 74061, *d.* Histon Rosebud 43rd 186808 *by* Hammonds Herald 44353.

2749 R.N.—JOHN R. HORNE-PAYNE, Crownfields, Kelvedon Hatch, Essex, for **Crownfields Prosperity 3rd.**

H.C.—2747. C.—2750, 2754.

Tamworths.

Class 337.—*Tamworth Boars, born in or before* 1931.

2759 I., Champion[1] & R.N. for Champion.[2]—LT.-COL. C. J. H. WHEATLEY, Berkswell Hall, Berkswell, Coventry, for **Berkswell Up to Date 4th** 78813 (425), born Jan. 11, 1931; *s.* Wall Up to Date 73887, *d.* Berkswell Angela 192368 *by* Verzons Michael 66529.

Class 338.—*Tamworth Boars, born in* 1932.[3]

2763 I. & R.N. for Champion.[1]—LT.-COL. C. J. H. WHEATLEY, Berkswell Hall, Berkswell, Coventry, for **Berkswell Up to Date 5th** 82191 (643), born Jan. 6; *s.* Wall Up to Date 73887, *d.* Peartown Golden Slumbers 3rd 183256 *by* Leighton William 28453.

2762 II.—J. ALBERT FROST, New Hall Farm, Sutton Coldfield, for **Coldfield Maurice** 82213 (76), born Feb. 6; *s.* Coldfield Monty, *d.* Coldfield Nancy 209228 *by* Coldfield Nicholas 73825.

2761 III.—W. A. BINDLEY, Woodbourne, Augustus Road, Edgbaston, for **Pamington Bobbie 6th** 82241 (41), born Jan. 17; *s.* Dollar Bobbie 73777, *d.* Pamington Constance 3rd 198460 *by* Berkswell Red Ensign 70537.

Class 339.—*Tamworth Boars, born in* 1933.

2766 I.—LT.-COL. C. J. H. WHEATLEY, Berkswell Hall, Berkswell, Coventry, for **Berkswell Luck** (827), born Jan. 7; *s.* Milton Luck 3rd 78861, *d.* Berkswell Beauty 16th 209172 *by* Verzons Matthew 73871.

2764 II.—W. A. BINDLEY, Woodbourne, Augustus Road, Edgbaston, for **Pamington Bobbie 7th** (99), born Jan. 11; *s.* Berkswell Bobbie 6th 78797, *d.* Pamington Constance 5th 198464 *by* Berkswell Red Ensign 70537.

2769 III.—T. R. WILSON, Victoria House, Rufforth, York, for **Rufforth Up to Date** (156), born Jan. 17; *s.* Whittingham Dude 3rd 78871, *d.* Rufforth Primrose 198486 *by* Verzons Christopher 70597.

2768 R.N.—T. R. WILSON, for **Rufforth Model Boy.**

Class 340.—*Tamworth Breeding Sows, born in or before* 1931.

2772 I., R.N. for Champion[2] & Champion.[4]—T. R. WILSON, Victoria House, Rufforth, York, for **Inges Patience 2nd** 198442 (54), born Nov. 22, 1929, farrowed Jan. 10, bred by Mrs. Inge, Thorpe Hall, Tamworth; *s.* Basildon Nomen 3rd 64188, *d.* Inges Patsy 192502 *by* Knowle Brutus 2nd 47727.

2770 II.—W. A. BINDLEY, Woodbourne, Augustus Road, Edgbaston, for **Pamington Constance 5th** 198464 (31), born July 31, 1930, farrowed Jan. 11; *s.* Berkswell Red Ensign 70537, *d.* Berkswell Constance 4th 183106 *by* Verzons Red Gauntlet 59881.

2771 III.—LT.-COL. C. J. H. WHEATLEY, Berkswell Hall, Berkswell, Coventry, for **Berkswell Slumbers 3rd** 217290 (488), born May 12, 1931, farrowed March 8; *s.* Dollar Bobbie 73777, *d.* Peartown Golden Slumbers 3rd 183256 *by* Leighton William 28453.

341.—*Tamworth Sows, born in* 1932.

2780 I. & R.N. for Champion.[4]—LT.-COL. C. J. H. WHEATLEY, Berkswell Hall, Berkswell, Coventry, for **Berkswell Slumbers 7th** 217298 (651), born Jan. 6; *s.* Wall Up to Date 73887, *d.* Peartown Golden Slumbers 3rd 183256 *by* Leighton William 28453.

2773 II—W. A. BINDLEY Woodbourne, Augustus Road, Edgbaston, for **Pamington Red Cap** 217394 (52), born March 7; *s.* Milton Luck 3rd 78861, *d.* Berkswell Red Cap 7th 209206 *by* Verzons Michael 66529.

2774 III—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks., for **Burnham Mermaid** 217310 (162), born Feb. 27; *s.* Milton Prince 2nd 66503, *d.* Hookstile Mercy 9th 178252 *by* Roxley Edward 3rd 47155.

2778 R.N.—WALTER W. RYMAN, Wall, Lichfield, for **Wall Diamond 5th.**

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[1] Champion Silver Gilt Medal, or £2 10s. in cash, given by the National Pig Breeders' Association for the best Tamworth Boar.

[2] Silver Challenge Cup given through the National Pig Breeders' Association for the best Tamworth Pig.

[3] Prizes given by the National Pig Breeders' Association.

[4] Champion Silver Gilt Medal, or £2 10s. in cash, given by the National Pig Breeders' Association for the best Tamworth Sow.

Class 342.—*Tamworth Sows, born in* 1933.

2782 **I.**—Lt.-Col. C. J. H. Wheatley, Berkswell Hall, Berkswell, Coventry, for **Berkswell Rose 5th** (831), born Jan. 30; *s.* Berkswell Peter 3rd 82187, *d.* Berkswell Rose 4th 217282 *by* Dollar Bobbie 73777.

2781 **II.**—W. A. Bindley, Woodbourne, Augustus Road, Edgbaston, for **Pamington Constance 17th** (103), born Jan. 11; *s.* Berkswell Bobbie 6th 78797, *d.* Pamington Constance 5th 198464 *by* Berkswell Red Ensign 70537.

2784 **III.**—T. R. Wilson, Victoria House, Rufforth, York, for **Rufforth Messenger Girl** (154), born Jan. 15; *s.* Whittingham Dude 3rd 78871, *d.* Berkswell Red Cap 4th 192428 *by* Basildon Tommy Kirnam 10th 64139.

2783 **R.N.**—Lt.-Col. C. J. H. Wheatley, for **Berkswell Rose 6th.**

Berkshires.

Class 343.—*Berkshire Boars, born in or before* 1931.

2789 **I., Champion[1] & Champion[2].**—H. M. Hepworth, Manor Farm, Farnham, Knaresborough for **Chapel President 6th** 3659, born July 21, 1931, bred by T. E. Prest, Chapel Farm, Swinton, Malton; *s.* Highfield Royal President 22nd 2061, *d.* Swinton Cary Margaret 4th 12136 *by* Hammonds Carrier 1022.

2787 **II.**—E. Clifton-Brown, Burnham Grove, Burnham, Bucks., for **Lenton Keystone** 3551, born Feb. 20, 1931, bred by S. Cecil Armitage, Lenton Fields, Nottingham; *s.* Bridge Keystone 1961, *d.* Lagents Victoria Margaret 8176 *by* Eaton Vortigan 398.

2790 **III.**—H. C. Inwood, Chorley House, West Wycombe, Bucks., for **Ridgemoor Roy Pygmalion 9th** 8743, born April 1, 1931; *s.* Highfield Royal Pygmalion 13th 2077, *d.* Hillfoot Princess 3rd 7960 *by* Pamber Ace of Spades 25757.

2791 **R.N.**—H. G. P. Jones, Hillsborough, Canford, Wimborne, for **Chapel President.**

Class 344.—*Berkshire Boars, born in* 1932, *before July* 1.

2792 **I. & R.N. for Champion.[1]**—S. Cecil Armitage, Lenton Fields, Nottingham, for **Lenton Keystone 2nd** 8711, born Jan. 5; *s.* Bridge Keystone 1961, *d.* Lenton Grand Duchess 10938 *by* Leadenham Duke 748.

2794 **II.**—E. Clifton-Brown, Burnham Grove, Burnham, Bucks., for **Burnham Prim Lad**, born March 7; *s.* Hillsborough Mr. Prim 6th 8231, *d.* Burnham Griqua 11538 *by* Burnham Nutcracker 2785.

2793 **III.**—S. Cecil Armitage, for **Lenton Keystone 3rd** 8713, born Jan. 5; *s.* Bridge Keystone 1961, *d.* Lenton Grand Duchess 10938 *by* Leadenham Duke 748.

Class 345.—*Berkshire Boars, born in* 1932, *on or after July* 1.[3]

2797 **I.**—T. E. Prest, Chapel Farm, Swinton, Malton, for **Chapel President 7th** 3661, born July 3; *s.* Highfield Royal President 22nd 2061, *d.* Swinton Woodland Margaret 13556 *by* Woodhouse Amanullah 2nd 2691.

2796 **II.**—Stephen D. Player, Whatton Manor, Nottingham, for **Whipling Statesman** 3785, born July 18; *s.* Lenton Vortigan 3277, *d.* Syerston Sally Lunn 8th 11824 *by* Syerston President 2649.

2795 **III.**—H. C. Inwood, Chorley House, West Wycombe, Bucks., for **Ridgemoor Duke**, born July 9; *s.* Syerston Duke 3391, *d.* Hillfoot Miss 2nd 11750 *by* Hillfoot Premier 2885.

Class 346.—*Berkshire Boars, born in* 1933.

2799 **I.**—Major Clive Behrens, Swinton Grange, Malton, for **Swinton Star**, born Jan. 7; *s.* Syerston President 6th 3398, *d.* Swinton Winsome Margaret 2nd 12232 *by* Woodhouse Amanullah 2nd 2691.

2798 **II.**—S. Cecil Armitage, Lenton Fields, Nottingham, for **Lenton Keystone 6th**, born Jan. 1; *s.* Lenton Keyboard 3549, *d.* Lenton Grand Duchess 10938 *by* Leadenham Duke 748.

2804 **III.**—H. G. P. Jones, Hillsborough, Canford, Wimborne, for **Hillsborough President 2nd**, born Jan. 7; *s.* Chapel President 2808, *d.* Langbourne Maruja 9700 *by* Kingstone British King 1692.

2806 **IV.**—T. E. Prest, Chapel Farm, Swinton, Malton, for **Chapel Keynote 3rd**, born Jan. 9; *s.* Chapel Keynote 3169, *d.* Swinton Woodland Margaret 13556 *by* Woodhouse Amanullah 2nd 2691.

2800 **R.N.**—E. Clifton-Brown, Burnham Grove, Burnham, Bucks., for **Burnham Keystone.**

H.C.—2801.

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[1] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Berkshire Boar.

[2] The "Eaton" Silver Challenge Cup given through the National Pig Breeders' Association for the best Berkshire Pig.

[3] Prizes given by the National Pig Breeders' Association.

Class 347.—*Berkshire Breeding Sows, born in or before* 1931.

2808 **I., R.N. for Champion**[1] **& Champion.**[2]—Major Clive Behrens, Swinton Grange, Malton, for **Swinton Precious Margaret 6th 12922**, born Jan. 4, 1931, farrowed March 5; *s.* Woodhouse Amanullah 2nd 2691, *d.* Swinton Bold Margaret 7th 11172 *by* Highfield Roy President 6th 1638.

2807 **II.**—S. Cecil Armitage, Lenton Fields, Nottingham, for **Bridge Primrose 11506**, born July 1, 1930, farrowed Jan. 12, bred by J. Fricker, Junr., Bridge Farm, Hardington, Yeovil; *s.* Bridge Keystone 1961, *d.* Bridge Patience 7482 *by* Iwerne Exchequer 784.

2810 **III.**—H. C. Inwood, Chorley House, West Wycombe, Bucks., for **Ridgemoor Golden Melody 3rd 12014**, born July 2, 1929, farrowed March 14; *s.* Highfield Royal Pygmalion 13th 2077, *d.* Ridgemoor Golden Melody 8534 *by* Motcombe Scott 22259.

2811 **R.N.**—H. G. P. Jones, Hillsborough, Canford, Wimborne, for **Hillsborough Bright Girl 6th.**

H.C.—2809, 2812.

Class 348.—*Berkshire Sows, born in* 1932, *before July* 1.

2816 **I. & R.N. for Champion.**[2]—E. Clifton-Brown, Burnham Grove, Burnham, Bucks., for **Burnham Griqua Girl 13136**, born March 7; *s.* Hillsborough Mr. Prim 6th 3231, *d.* Burnham Griqua 11538 *by* Burnham Nutcracker 2785.

2814 **II.**—S. Cecil Armitage, Lenton Fields, Nottingham, for **Lenton Grand Duchess 9th 13370**, born Jan. 5; *s.* Bridge Keystone 1961, *d.* Lenton Grand Duchess 10938 *by* Leadenham Duke 748.

2813 **III.**—S. Cecil Armitage, for **Lenton Grand Duchess 8th 13368**, born Jan. 5; *s.* Bridge Keystone 1961, *d.* Lenton Grand Duchess 10938 *by* Leadenham Duke 748.

2815 **R.N.**—Major Clive Behrens, Swinton Grange, Malton, for **Swinton Turvy Margaret.**

H.C.—2817.

Class 349.—*Berkshire Sows, born in* 1932, *on or after July* 1.

2819 **I.**—S. Cecil Armitage, Lenton Fields, Nottingham, for **Lenton Patience**, born July 15; *s.* Hillsborough President 3519, *d.* Bridge Poppy 11504 *by* Bridge Keystone 1961.

2823 **II.**—T. E. Prest, Chapel Farm, Swinton, Malton, for **Chapel Margaret 12th 13206**, born July 3; *s.* Highfield Royal President 22nd 2061, *d.* Swinton Woodland Margaret 13556 *by* Woodhouse Amanullah 2nd 2691.

2822 **III.**—Stephen D. Player, Whatton Manor, Nottingham, for **Whipling Sally Lunn 13608**, born July 13; *s.* Lenton Vortigan 3277, *d.* Syerston Sally Lunn 8th 11324 *by* Syerston President 2649.

2820 **R.N.**—Major Clive Behrens, Swinton Grange, Malton, for **Swinton Smiling Margaret.**

H.C.—2821.

Class 350.—*Berkshire Sows, born in* 1933.

2832 **I.**—Stephen D. Player, Wratton Manor, Nottingham, for **Whipling Amelia**, born Jan. 11; *s.* Lenton British Duke 2nd 3543, *d.* Swinton Hopeful Amelia 2nd 12908 *by* Highfield Roy President 6th 1638.

2834 **II.**—T. E. Prest, Chapel Farm, Swinton, Malton, for **Chapel Margaret 14th**, born Jan. 9; *s.* Chapel Keynote 3169, *d.* Swinton Woodland Margaret 13556 *by* Woodhouse Amanullah 2nd 2691.

2830 **III.**—H. G. P. Jones, Hillsborough, Canford, Wimborne, for **Hillsborough Maruja 4th**, born Jan. 7; *s.* Chapel President 2803, *d.* Langbourne Maruja 9700 *by* Kingstone British King 1692.

2825 **IV.**—Major Clive Behrens, Swinton Grange, Malton, for **Swinton Sweet Margaret**, born Jan. 10; *s.* Syerston President 6th 3393, *d.* Swinton Winkie Margaret 13524 *by* Woodhouse Amanullah 2nd 2691.

2828 **R.N.**—Charles R. Dunkley, Moorfields, Warkton, Kettering, for **Warkton Sweet Baroness.**

Wessex Saddlebacks.

Class 351.—*Wessex Saddleback Boars, born in or before* 1931.

2841 **I., Champion**[3] **& Champion.**[4]—Douglas Vickers, Preston, Hitchin, for **Preston Val 3673**, born Aug. 25, 1931; *s.* Yarty Monarch 3rd 3282, *d.* Preston Venus 15325 *by* Preston Dandy 2935.

2839 **II., R.N. for Champion**[3] **& R.N. for Champion.**[4]—Henry T. Holloway, West Lavington, Devizes, for **Godalming Forester 2nd 3451**, born Jan. 20, 1930, bred by A. Freeland, Billingbear Farm, Binfield, Berks.; *s.* Godalming Masterpiece 3rd 3242, *d.* Preston Safrida 2nd 15201 *by* Brandon Tomahawk 2nd 2879.

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[1] The "Eaton" Silver Challenge Cup given through the National Pig Breeders' Association for the best Berkshire Pig.

[2] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Berkshire Sow.

[3] Champion Silver Gilt Medal, or £2 10s. cash, given by the National Pig Breeders' Association for the best Wessex Saddleback Boar.

[4] Silver Challenge Cup, given by the National Pig Breeders' Association for the best Wessex Saddleback Pig.

2837 III.—Fred W. Gentle, 33 High Street, Brandon, Suffolk, for **Brandon David 3495**, born Jan. 1, 1931; *s.* Brandon Dunstan 3161, *d.* Brandon Daybreak 14829 *by* Preston Dunstan 2937.

2840 R.N.—Douglas Vickers, for **Preston Defender.**

H.C.—2835.

Class 352.—*Wessex Saddleback Boars, born in* 1932.[1]

2845 I—Douglas Vickers, Preston, Hitchin, for **Preston Sovereign 3693**, born Feb. 9; *s.* Preston Dandy 2935, *d.* Preston Strawberry 1st 15836 *by* Chellaston Gone Away 3159.

2842 II.—James R. Fox, Graylands Farm, Wood Street, Guildford, for **Holbury Masterman 3663**, born Feb. 23, bred by G. R. Southwell, Holbury Farm, Lockerley, Romsey; *s.* Forest Master 3358, *d.* Holbury Effie 15241 *by* Awebridge Standard 2646.

2843 III.—Henry Kirke, Rothwell, Caistor, Lincs., for **Preston Selim 3608**, born Jan. 2, bred by Douglas Vickers, Preston, Hitchin; *s.* Godalming Masterpiece 3rd 3242, *d.* Preston Spot 15872 *by* Chellaston Gone Away 3159.

2844 R.N.—H. Neaverson, Scotts Farm, Glinton, Peterborough, for **Boreham Barrington.**

Class 353.—*Wessex Saddleback Boars, born in* 1933.

2847 I.—A. Freeland, Billingbear Farm, Binfield, Berks., for **Godalming Admiral 8715**, born Jan. 8; *s.* Godalming Caesar 2nd 3634, *d.* Godalming Daisy 14th 16506.

2850 II.—Frank William Gilbert, The Manor, Chellaston, Derby, for **Chellaston Squire 2nd 3704**, born Jan. 6; *s.* Preston Tomahawk 3422, *d.* Chellaston Druidess 3rd 16245 *by* Besford Hero 1st 3168.

2849 III.—Frank William Gilbert, for **Chellaston Squire 3703**, born Jan. 6; *s.* Preston Tomahawk 3422, *d.* Chellaston Druidess 3rd 16245 *by* Besford Hero 1st 3168.

2853 R.N.—Douglas Vickers, Preston, Hitchin, for **Preston Cossack 2nd.**

Class 354.—*Wessex Saddleback Breeding Sows, born in or before* 1931.

2863 **I. & Champion.**[2]—Douglas Vickers, Preston, Hitchin, for **Preston Value 16838**, born Aug. 25, 1931, farrowed Jan. 1; *s.* Yarty Monarch 3rd 3282, *d.* Preston Venus 15825 *by* Preston Dandy 2935.

2855 II.—H. L. Brooksbank, Sandrock, Tickhill, Yorks., for **Chellaston Melon 15577**, born Oct. 7, 1928, farrowed Jan. 10, bred by F. W. Gilbert, The Manor, Chellaston, Derby; *s.* Preston Dolphin 2967, *d.* Axhill Cucumber 12595 *by* Cattistock Gone Away 1729.

2857 III.—G. A. Cole, Sidbury Mills, Sidmouth, for **Brandon Daybreak 14829**, born Nov. 20, 1927, farrowed Jan. 7, bred by F. W. Gentle, 33 High Street, Brandon; *s.* Preston Dunstan 2937, *d.* Preston Daisy 13541 *by* Oakley Prior 1678.

2856 R.N.—H. L. Brooksbank, for **Sandrock Star 1st.**

H.C.—2862.

Class 355.—*Wessex Saddleback Sows, born in* 1932.

2867 **I. & R.N. for Champion.**[2]—Fred W. Gentle, 33 High Street, Brandon, for **Holbury Rosaline 16336**, born Jan. 29, bred by G. R. Southwell, Tockerley, Romsey, Hants; *s.* Forest Master 3358, *d.* Holbury Recollection 15655 *by* Awebridge Standard 2646.

2864 II.—H. L. Brooksbank, Sandrock, Tickhill, Yorks., for **Sandrock Star 9th**, born Feb. 5; *s.* Yarty Monarch 5th 3408, *d.* Sandrock Star 1st 14376 *by* Welwyn Rufus 2502.

2866 III.—Fred W. Gentle, for **Chellaston Sally 13th 16349**, born Jan. 5, bred by F. W. Gilbert, The Manor, Chellaston, Derby; *s.* Chellaston Royal's Son 2nd 3450, *d.* Chellaston Sally 10th 15826 *by* Besford Hero 1st 3168.

2869 R.N.—Douglas Vickers, Preston, Hitchin, for **Preston Devina 2nd.**

H.C.—2868.

Class 356.—*Wessex Saddleback Sows, born in* 1933.

2872 I.—G. A. Cole, Sidbury Mills, Sidmouth, for **Sid-Vale Gift 16821**, born Jan. 14; *s.* Sid-Vale Rover 3428, *d.* Sockhill Ena 6th *by* Chettle Ariel 2806.

2875 II.—Frank William Gilbert, The Manor, Chellaston, Derby, for **Chellaston Druidess 4th 16804**, born Jan. 6; *s.* Preston Tomahawk 3422, *d.* Chellaston Druidess 3rd 16245 *by* Besford Hero 1st 3168.

2876 III.—Frank William Gilbert, for **Chellaston Druidess 6th 16806**, born Jan. 6; *s.* Preston Tomahawk 3422, *d.* Chellaston Druidess 3rd 16245 *by* Besford Hero 1st 3168.

2880 IV.—Douglas Vickers, Preston, Hitchin, for **Preston Viyella 4th 16773**, born Jan. 4; *s.* Preston Defender 3477, *d.* Preston Viyella 15857 *by* Preston Dandy 2985.

2879 R.N.—Henry Kirke, Rothwell, Caistor, Lincs., for **Ravendale Daphne 7th.**

H.C.—2874.

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[1] Prizes given by the National Pig Breeders' Association.

[2] Champion Silver Gilt Medal, or £2 10s. cash, given by the National Pig Breeders' Association for the best Wessex Saddleback Sow.

Large Blacks.

Class 357.—*Large Black Boars, born in or before* 1931.

2885 **I. & Champion.**[1]—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Kedington Broker E. 469**, born Sept. 3, 1928; *s.* Newland Selim C. 31, *d.* Kedington Mona 2nd A. 5234 *by* Cornwood Peter 20875.

2881 **II. & R.N. for Champion.**[1]—Frank William Gilbert, The Manor, Chellaston, Derby, for **Pakenham Lucrative G283**, born April 15, 1930, bred by D. W. P. Gough, Pakenham Manor, Bury St. Edmunds; *s.* Pakenham Candidate F241, *d.* Pakenham Lucy 4th E606 *by* Awton Sampson 21891.

2887 **III.**—W. W. Woolland, Baydon Manor, Ramsbury, Marlborough, for **Baydon King 5th H. 239**, born May 2, 1931; *s.* Brent H. J. K. F. 437, *d.* Baydon Nightingale 72nd F. 1604 *by* Baydon Satisfied 5th E. 449.

2884 **R.N.**—Mrs. M. E. Mansell, Kingston Stert, Chinnor, Oxon., for **Redmarley General.**

H.C.—2883.

2885, 2917, 2932 **Gold Vase.**[2]—Frank Sainsbury, for **Kedington Broker, Kedington Caress and Kedington Constance 24th.**

2887, 2921, 2948 **R.N. for Gold Vase.**[2]—W. W. Woolland, for **Baydon King 5th, Baydon Nightingale 69th and Baydon Nightingale 96th.**

Class 358.—*Large Black Boars, born in* 1932, *before July* 1.

2890 **I.**—Truscott Bros., Trewithen, Sticker, St. Austell, for **Trewithen Some Day K. 77**, born Jan. 12; *s.* Valley Benefit 1st G. 609, *d.* Trewithen Queen 24th G. 1862 *by* Trewithen Highlander F. 255.

2888 **II.**—The Marquess of Ailesbury, Savernake Forest, Marlborough, for **Savernake Nigger K. 159**, born Feb. 9; *s.* Baydon Lad 4th G. 631, *d.* Savernake Nightingale 2nd G. 1488 *by* Savernake Ranger's Model C. 907.

2889 **III.**—Frank William Gilbert, The Manor, Chellaston, Derby, for **Chellaston Climber 2nd K. 27**, born Jan. 3; *s.* Chellaston Bouncer H. 33, *d.* Streetly Bangle 50th E. 1636 *by* Streetly Climber D. 597.

Class 359.—*Large Black Boars, born in* 1932, *on or after July* 1.[3]

2896 **I.**—Sir Edward Mann, Bart., Thelveton Hall, Diss, Norfolk, for **Thelveton Hero 44th K. 289**, born July 6; *s.* Thelveton Hero B. 741, *d.* Bardolph Sela 18th E. 908 *by* Kedington Pattern D. 385.

2900 **II.**—W. W. Woolland, Baydon Manor, Ramsbury, Marlborough, for **Baydon King John K. 305**, born July 9; *s.* Tortworth Emperor G. 21, *d.* Cornwood Empress 1st G. 1316 *by* Treveglos Chief 1st C. 109.

2899 **III.**—Welbeck Estates Co., Ltd., Mansfield Woodhouse, Notts., for **Fowlmere Night Boy 2nd K. 195**, born July 19, bred by W. C. Jackson, Fowlmere, Royston; *s.* Bardolph Night Boy E. 417, *d.* Fowlmere Fancy 2nd F. 364 *by* Bassingbourn Royal 2nd B. 641.

2892 **IV.**—G. A. Goodchild, Great Yeldham Hall, Great Yeldham, Essex, for **Tartar Expectation K. 328**, born July 9; *s.* Kedington None Such 3rd G. 298, *d.* Tartar Mary 4th G. 1414 *by* Kedington Broker E. 469.

2893 **R.N.**—R. Gynn & Son, Treslay, Boscastle, Cornwall, for **Treslay Bumper 4th.**

H.C.—2891.

Class 360.—*Large Black Boars, born in* 1933.

2903 **I.**—Frank William Gilbert, The Manor, Chellaston, Derby, for **Pakenham Leader 1st L. 17**, born Jan. 8, bred by D. W. P. Gough, Pakenham Manor, Bury St. Edmunds; *s.* Westpetherwin Leader 2nd E. 553, *d.* Thelveton Annie 6th E. 2818 *by* Thelveton Hero B. 741.

2908 **II.**—W. W. Woolland, Baydon Manor, Ramsbury, Marlborough, for **Baydon Knight L. 48**, born Jan. 4; *s.* Baydon King 5th H. 239, *d.* Baydon Nightingale 69th F. 1204 *by* Baydon Prior 5th E. 381.

2902 **III.**—Harry E. Bastard, Tinten Manor, St. Tudy, Cornwall, for **Tinten Prize Man L. 5**, born Jan. 1; *s.* Cornwood Imperialist G. 547, *d.* Tinten Black Bess 60th E. 1132 *by* Tinten Leader C. 849.

2901 **R.N.**—F. G. Alexander, Laurels Farm, Pulham Market, Diss, for **Depwade Royalist 3rd.**

H.C.—2904.

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[1] Silver Challenge Cup, and Gold Medal to the Breeder, given by the Large Black Pig Society, for the best Large Black Boar.

[2] The "Baydon" Gold Vase given through the Large Black Pig Society for the best Group consisting of one Boar from Classes 357, 358 or 359, one Breeding Sow from Class 361, and one Sow from Classes 361, 362 or 363.

[3] Prizes, except Fourth, given by the Large Black Pig Society.

Class 361.—*Large Black Breeding Sows, born in or before* 1931.

2921 **I. & Champion.**[1]—W. W. Woolland, Baydon Manor, Ramsbury, Marlborough, for **Baydon Nightingale 69th F. 1204**, born Aug. 26, 1929, farrowed Jan. 4; *s.* Baydon Prior 5th E. 381, *d.* Baydon Nightingale 52nd E. 162 *by* Valley General 2nd 25401.

2916 **II.**—Mrs. M. E. Mansell, Kingston Stert, Chinnor, Oxon., for **Aston Deddington 23rd G. 1118**, born May 17, 1930, farrowed Feb. 27; *s.* Whiteway Dauntless 3rd E. 227, *d.* Aston Deddington 18th E. 536 *by* Pednor Royal 2nd 29389.

2913 **III.**—John A. Lawford, Heronsdale Manor, Waldron, Sussex, for **Broyle Lavinia 1st G. 182**, born Jan. 5, 1930, farrowed March 18; *s.* Treluckey Warrior 2nd C. 995, *d.* Broyle Nymph 1st A. 5154 *by* Arran Dandy 31159.

2909 **IV.**—The Marquess of Ailesbury, Savernake Forest, Marlborough, for **Baydon Nightingale 59th E. 1246**, born Sept. 24, 1928, farrowed Jan. 1, bred by W. W. Woolland, Baydon Manor, Ramsbury; *s.* Kibbear Royal Prior 4th A. 1225, *d.* Baydon Nightingale 22nd C. 3098 *by* Valley General 2nd 25401.

2910 **V.**—Frank William Gilbert, The Manor, Chellaston, Derby, for **Fowlmere Famous 29th H. 586**, born April 2, 1931, farrowed Jan. 9, bred by W. C. Jackson, Fowlmere, Royston; *s.* Bardolph Night Boy E. 417, *d.* Fowlmere Famous 3rd F. 352 *by* Bassingbourn Royal 2nd B. 641.

2915 **R.N.**—Sir Edward Mann, Bart., Thelveton Hall, Diss, Norfolk, for **Fowlmere Fancy 44th.**

H.C.—2911, 2920.

Class 362.—*Large Black Sows, born in* 1932, *before July* 1.

2932 **I. & R.N. for Champion.**[1]—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Kedington Constance 24th K. 66**, born Jan. 13; *s.* Docking Beaverbrook F. 331, *d.* Kedington Constance 18th D. 2466 *by* Kedington Brigand C. 563.

2925 **II.**—G. A. Goodchild, Great Yeldham Hall, Great Yeldham, Essex, for **Tartar Mary 8th K. 134**, born Jan. 2; *s.* Kedington None Such 3rd G. 293, *d.* Tartar Mary 5th G. 2414 *by* Kedington Broker E. 469.

2922 **III.**—F. G. Alexander, Laurels Farm, Pulham Market, Diss, for **Depwade Rose 2nd K. 46**, born Jan. 4; *s.* Kibbear Royalist 10th F. 391, *d.* Thelveton Beatrice 7th F. 1656 *by* Thelveton Hero B. 741.

2930 **IV.**—Leckford Estate, Ltd., Leckford, Stockbridge, for **Leckford Constance 9th K. 930**, born Feb. 20; *s.* Tillington Highlander 7th G. 477, *d.* Leckford Constance F. 1884 *by* Kibbear Royal Prior 5th C. 119.

2931 **V.**—Mrs. M. E. Mansell, Kingston Stert, Chinnor, Oxon., for **Aston Deddington 34th K. 508**, born Jan. 13; *s.* Redmarley General G. 175, *d.* Aston Deddington 23rd G. 1118 *by* Whiteway Dauntless 3rd E. 227.

2928 **R.N.**—John A. Lawford, Heronsdale Manor, Waldron, Sussex, for **Broyle Suzette 1st.**

H.C.—2926.

Class 363.—*Large Black Sows, born in* 1932, *on or after July* 1.

2939 **I.**—G. A. Goodchild, Great Yeldham Hall, Great Yeldham, Essex, for **Tartar Julia 2nd K. 1160**, born July 9; *s.* Kedington None Such 3rd G. 293, *d.* Tartar Mary 4th G. 1414 *by* Kedington Broker E. 469.

2937 **II.**—J. W. Craven & Son, Upper Hurst, Hartington, Buxton, for **Hartington Iolanthe K. 800**, born July 1; *s.* Broyle Laddie 1st H. 181, *d.* Orchard Beverley 42nd F. 1090 *by* Kibbear Royal Good Boy E. 525.

2938 **III.**—Frank William Gilbert, The Manor, Chellaston, Derby, for **Pakenham Adorable 2nd K. 908**, born July 5, bred by D. W. P. Gough, Pakenham Manor, Bury St. Edmunds; *s.* Yam Esk 2nd F. 129, *d.* Pakenham Moonbeam 2nd E. 14 *by* Drayton Proconsul C. 985.

2943 **IV.**—John A. Lawford, Heronsdale Manor, Waldron, Sussex, for **Broyle Suzanne 1st K. 1094**, born July 17; *s.* Treluckey Sunray G. 327, *d.* Broyle Marostica 3rd D. 314 *by* Arran Dandy 31159.

2936 **V.**—F. G. Alexander, Laurels Farm, Pulham Market, Diss, for **Depwade Rose 4th K. 856**, born July 5; *s.* Kibbear Royalist 10th F. 391, *d.* Thelveton Beatrice 7th F. 1656 *by* Thelveton Hero B. 741.

2945 **R.N.**—Sir Edward Mann, Bart., Thelveton Hall, Diss, for **Thelveton Sela 21st.**

H.C.—2941, 2944.

Class 364.—*Large Black Sow, born in* 1933.

2950 **I.**—Harry E. Bastard, Tinten Manor, St. Tudy, Cornwall, for **Tinten Black Bess 70th L. 6**, born Jan. 1; *s.* Cornwood Imperialist G. 547 *d.* Tinten Black Bess 60th E. 1132 *by* Tinten Leader C. 849.

2955 **II.**—John A. Lawford, Heronsdale Manor, Waldron, Sussex, for **Broyle Sunbeam 1st L. 76**, born Jan. 14; *s.* Treluckey Sunray G. 327, *d.* Broyle Royal Queen H. 1160 *by* Treveglos Felix 4th G. 5.

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[1] Silver Challenge Cup, and Gold Medal to the Breeder, given by the Large Black Pig Society, for the best Large Black Sow.

2951 **III.** J. W. Craven & Son, Upper Hurst, Hartington, Buxton, for **Orchard Beverley 59th** L. 88, born Jan. 2, bred by G. W. Mitchell & Son, Wilberfoss, York; *s.* Spella Park Dan H. 437, *d.* Orchard Beverley 49th G. 1664 *by* Kibbear Royal Good Boy E. 525.

2956 **IV.**—John A. Lawford, for **Broyle Sunbeam 2nd,** born Jan. 14; *s.* Treluckey Sunray G. 327, *d.* Broyle Royal Queen H. 1160 *by* Treveglos Felix 4th G. 5.

2954 **R.N.**—G. A. Goodchild, Great Yeldham Hall, Great Yeldham, Essex, for **Tartar Mary 10th.**

H.C.—2952.

Gloucestershire Old Spots.

Class 365.—*Gloucestershire Old Spots Boars, born in or before* 1931.

2963 **I., Champion[1] & Champion.[2]**—J. F. Wright, Olton Farm, Solihull, Birmingham, for **Solihull Bob 5915,** born May 4, 1930; *s.* Solihull Buster 5858, *d.* Solihull Bonetta Z. 385 *by* Maiden Bradley Submarine 2nd 5720.

2961 **II.**—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Bruce 6th 5971,** born July 4, 1931; *s.* Hempstead Jim 17th 5888, *d.* Nashes Blossom 28th Z. 535 *by* Holmwood Wight 5657.

2694 **III.**—J. F. Wright, for **Solihull Joe 5870,** born Feb. 3, 1929; *s.* Solihull Punch 5774, *d.* Solihull Josephine 5th Z. 270 *by* Solihull Jock 5666.

2962 **R.N.**—Sherriff & Sons, for **Nashes Duke 21st.**

Class 366.—*Gloucestershire Old Spots Boars, born in* 1932.[3]

2969 **I. & R.N. for Champion.[1]**—J. F. Wright, Olton Farm, Solihull, Birmingham, for **Solihull Boxer 5979,** born Feb. 2; *s.* Solihull Bob 5915, *d.* Solihull Josephine 12th Z. 605 *by* Holmwood Lillywhite 5th 5869.

2965 **II.**—Reginald H. Hole, Clapcote Farm, Grittleton, Chippenham, for **Chalfield Michael 5980,** born March 13, bred by Major R. F. Fuller, Great Chalfield, Melksham; *s.* Beara Michael 5867, *d.* Chalfield Blossom 7th Z. 588 *by* Maiden Bradley Judge 2nd 5825.

2968 **III.**—J. F. Wright, for **Solihull Bob 3rd 5987,** born Sept. 4; *s.* Solihull Bob 5915, *d.* Solihull Primrose 7th Z. 571 *by* Solihull Buster 5858.

2966 **R.N.**—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Bruce 7th.**

H.C.—2967.

Class 367.—*Gloucestershire Old Spots Boars, born in* 1933.

2971 **I.**—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Duke 25th 5995,** born Jan. 11; *s.* Solihull Peter 5936, *d.* Nashes Duchess 51st Z. 633 *by* Pevensey Hero 1st 5820.

2972 **II.**—J. F. Wright, Olton Park, Solihull, Birmingham, for **Solihull Bob 4th 5990,** born Jan. 20; *s.* Solihull Bob 5915, *d.* Solihull Josephine 6th Z. 383 *by* Maiden Bradley Submarine 2nd 5720.

2970 **III.**—Sherriff & Sons, for **Nashes Bruce 8th 5986,** born Jan. 4; *s.* Solihull Peter 5936, *d.* Nashes Blossom 30th Z. 737 *by* Hempstead Jim 17th 5888.

2973 **R.N.**—J. F. Wright, for **Solihull Joe 3rd.**

Class 368.—*Gloucestershire Old Spots Breeding Sows, born in or before* 1931.

2976 **I. & R.N. for Champion.[4]**—J. F. Wright, Olton Farm, Solihull, Birmingham, for **Mitcheltroy Lady Z. 227,** born July 3, 1927, farrowed Jan. 24, bred by F. G. Jones, Mitcheltroy, Monmouth; *s.* Hempstead Jim 1st 5586, *d.* Mitcheltroy Magpie 13426 *by* Birdlip Boss 1675.

2974 **II.**—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Blossom 30th Z. 737,** born July 4, 1931, farrowed Jan. 4; *s.* Hempstead Jim 17th 5888, *d.* Nashes Blossom 28th Z. 535 *by* Holmwood Wight 5657.

2975 **III.**—Sherriff & Sons, for **Nashes Duchess 51st Z. 633,** born Jan. 2, 1931, farrowed Jan. 11; *s.* Pevensey Hero 5820, *d.* Nashes Duchess 44th Z. 439 *by* Hempstead Spot 5619.

2977 **R.N.**—J. F. Wright, for **Solihull Primrose 8th.**

Class 369.—*Gloucestershire Old Spots Sows, born in* 1932.

2983 **I., Champion[4] & R.N. for Champion.[2]**—J. F. Wright, Olton Farm, Solihull, Birmingham, for **Solihull Josephine 14th Z. 740,** born Feb. 2; *s.* Solihull Bob 5915, *d.* Solihull Josephine 12th Z. 605 *by* Holmwood Lillywhite 5th 5869.

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[1] Silver Challenge Cup given through the Gloucestershire Old Spots Pig Society for the best Boar.

[2] Perpetual Silver Challenge Cup given through the Gloucestershire Old Spots Pig Society for the best Gloucestershire Old Spots Pig.

[3] Prizes given by the Gloucestershire Old Spots Pig Society.

[4] Perpetual Silver Challenge Cup given through the Gloucestershire Old Spots Pig Society for the best Sow.

2982 **II.**—J. F. Wright, for **Solihull Bonetta 5th Z. 755**, born March 2; *s.* Solihull Buster 5858, *d.* Solihull Bonetta Z. 385 *by* Maiden Bradley Submarine 2nd 5720.

2981 **III.**—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Duchess 55th Z. 749**, born Sept. 6; *s.* Hempstead Jim 17th 5888, *d.* Nashes Duchess 49th Z. 631 *by* Hempstead Spot 5619.

2978 **R.N.**—S. C. Flook, Tynings Farm, Codrington, Chipping Sodbury, for **Tyning Beam.**

H.C.—2979, 2980.

Class 370.—*Gloucestershire Old Spots Sows, born in* 1933.

2985 **I.**—P. Franklin & Sons, Colney Heath Farms, St. Albans, for **Nashes Blossom 33rd Z. 772**, born Jan. 9, bred by Sherriff & Sons, Lemsford, Welwyn Garden; *s.* Solihull Peter 5936, *d.* Nashes Blossom 27th Z. 307 *by* Nashes Duke 8th 5646.

2989 **II.**—J. F. Wright, Olton Farm, Solihull, Birmingham, for **Solihull Susan 16th Z. 763**, born Jan. 22; *s.* Solihull Bob 5915, *d.* Solihull Susan 12th Z. 603 *by* Holmwood Lillywhite 5th 5869.

2987 **III.**—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Blossom 31st Z. 752**, born Jan. 4; *s.* Solihull Peter 5936, *d.* Nashes Blossom 30th Z. 737 *by* Hempstead Jim 17th 5888.

2986 **R.N.**—Reginald H. Hole, Clapcote Farm, Grittleton, Chippenham, for **Clapcote Anna.**

Cumberlands.

Class 371.—*Cumberland Boars, born in or before* 1932.

2992 **I. & Champion.**[1]—Isaac Gardhouse, Aikton House, Wigton, for **Bowston Monarch 8954** (J.O.R.M. 4), born March 16, 1930, bred by J. S. Jordan, The Granary, Kendal; *s.* Eamont Cherub 8180, *d.* Wampool Nora 7980 *by* Bowston Grenadier 6373.

2990 **II.**—William Bainbridge & Sons, Brougham Home Farm, Eamont Bridge, Penrith, for **Anchor Nobleman 9451** (P.W.J.N. 16), born Aug. 1, 1931, bred by Walter J. Parker, Cockelle House, Penrith; *s.* Fishergill Magnet 9012, *d.* Midge of Windermere 9395 *by* Eamont Cherub 8180.

2991 **III.**—Mrs. Carleton Cowper, Eamont, Penrith, for **Lonning Nat 9464** (G.H.L.N. 1), born July 22, 1932, bred by H. L. Gardhouse, Lonning Farm, Wigton; *s.* Lonning Mast 9434, *d.* Lonning Mary 9170 *by* Angerton House Jester 8588.

2993 **R.N.**—Ralph Millner, Angerton, Kirkbride, Carlisle, for **Prizet Michael.**

Class 372.—*Cumberland Boars, born in* 1933.[2]

2995 **I.**—Ralph Millner, Angerton, Kirkbride, Carlisle, for **Fairway Mike** (M.L.N. P1), born Jan. 18; *s.* Prizet Michael 9613, *d.* Fairway Doris 9727 *by* Greenspot Monarch 9015.

2994 **II.**—Isaac Gardhouse, Aikton House, Wigton, for **Aikton House King** (G.D.I. P3), born March 10; *s.* Bowston Monarch 8945, *d.* Eamont Ona *by* Eamont Ikey 8897.

2996 **III.**—Ralph Millner, for **Fairway Maurice** (M.L.N.P. 4), born Jan. 18; *s.* Prizet Michael 9613, *d.* Fairway Doris 9727 *by* Greenspot Monarch 9015.

Class 373.—*Cumberland Breeding Sows, born in or before* 1931.

2997 **I. & R.N. for Champion.**[1]—William Bainbridge & Sons, Brougham Home Farm, Eamont Bridge, Penrith, for **Woodside Marian 9087** (B.W.W.M. 7), born Jan. 12, 1930, farrowed Feb. 26; *s.* Lonning Joker 8214, *d.* Woodside Evie 8297 *by* Woodside Jester 6464.

3000 **II.**—Isaac Gardhouse, Aikton House, Wigton, for **Eamont Orpal 9725** (C.E.C.N. 15), born Feb. 22, 1931, farrowed Jan. 10, bred by Mrs. Carleton Cowper, Eamont, Penrith; *s.* Eamont Ikey 8897, *d.* Lonning Lucella 8880 *by* Bowston Grenadier 6873.

2998 **III.**—William Bainbridge & Sons, for **Woodside Naomi 9669** (B.W.W.N. 59), born July 12, 1931, farrowed March 13; *s.* Lonning Joker 8214, *d.* Woodside Evie 8297 *by* Woodside Jester 6464.

2999 **R.N.**—Mrs. Carleton Cowper, Eamont, Penrith, for **Lonning Nancy.**

Class 374.—*Cumberland Sows, born in* 1932.

3001 **I.**—Mrs. Carleton Cowper, Eamont, Penrith, for **Eamont Rowena** (C.E.C.O. 7), born July 7; *s.* Lonning Nat 9464, *d.* Eamont Penelope 9515 *by* Moor Ben 8999.

3002 **II.**—Henry L. Gardhouse, Lonning Farm, Wigton, for **Lonning Opal 9694** (G.H.L.O. 6), born April 1; *s.* Greenspot Michael 8932, *d.* Lonning Mary 9170 *by* Angerton House Jester 8588.

3003 **III.**—Ralph Millner, Angerton, Kirkbride, Carlisle, for **Fairway Myrtle** (M.L.N.O. 78), born July 20; *s.* Greenspot Monarch 9015, *d.* Woodside Myrtle 9106 *by* Wiggonrigg Jock 8590.

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[1] Silver Challenge Cup given by the Cumberland Pig Breeders' Association for the best Cumberland Pig.

[2] Prizes given by the Cumberland Pig Breeders' Association.

Class 375.—*Cumberland Sows, born in* 1933.

3005 I.—Isaac Gardhouse, Aikton House, Wigton, for **Aikton House Nora (G.D.I.P. 7),** born March 10; *s.* Bowston Monarch 8954, *d.* Eamont Ona *by* Eamont Ikey 8897.

3007 II.—Ralph Millner, Angerton, Kirkbride, Carlisle, for **Fairway Dora** (M.L.N.P. 10), born Jan. 18; *s.* Prizet Michael 9613, *d.* Fairway Doris 9727 *by* Greenspot Monarch 9015.

3006 III.—Ralph Millner, for **Fairway Dolly** (M.L.N.P. 8), born Jan. 18; *s.* Prizet Michael 9613, *d.* Fairway Doris 9727 *by* Greenspot Monarch 9015.

3004 R.N.—Mrs. Carleton Cowper, Eamont, Penrith, for **Eamont Shelagh.**

Essex.

Class 376.—*Essex Boars, born in or before* 1931.

3011 I.—William Ritchie, Marks Hall, Margaret Roding, Dunmow, for **Trueloves Atom** 3847 (498), born Jan. 3, 1931, bred by H. S. Ashton, Trueloves, Ingatestone; *s.* Barling Neptune 3261, *d.* Trueloves Light 18404 *by* Barling Governor 2493.

3009 II.—F. J. Bosworth, Greens Farm, Magdalen Laver, Ongar, for **Barling Judge** 3823 (486), born Jan. 27, 1930, bred by Kemsley & Kemsley, Shoeburyness; *s.* Cressing Jay 7th 3487, *d.* Barling Trustful 19602 *by* Pan Ernest 2693.

3012 III.—J. R. Tinney, Church End, Rickling, Newport, Essex, for **Cressing Grand Duke 8th** 3915 (529), born Jan. 12, 1931, bred by A. J. Cousins, Cressing Lodge, Braintree; *s.* Laver Peacock 3689, *d.* Cressing Grand Duchess 2nd 20362 *by* Cressing Jay 5th 3437.

3010 R.N.—King's College Farms, Worlaby Hall, Brigg, for **Cressing Grand Duke 3rd.**

Class 377.—*Essex Boars, born in* 1932.

3014 I.—William Ritchie, Marks Hall, Margaret Roding, Dunmow, for **Roothing Sultan 3rd** 3983 (563), born Jan. 1; *s.* Benningtons Sultan 3795, *d.* Roothing Lilac 6th 20902 *by* Rickling Duke 4th 3581.

3015 II.—J. R. Tinney, Church End, Rickling, Newport, Essex, for **Rickling Grand Duke** 4117 (464), born May 1; *s.* Cressing Grand Duke 8th 3915, *d.* Rickling Treasure 32nd 20856 *by* Barling Cadet 2797.

3013 III.—F. J. Bosworth, Greens Farm, Magdalen Laver, Ongar, for **Roothing Sultan 2nd** 3981 (562), born Jan. 2, bred by W. Ritchie, Marks Hall, Margaret Roding; *s.* Benningtons Sultan 3795, *d.* Roothing Biddy 10th 20914 *by* Rickling Duke 4th 3581.

3016 R.N.—J. R. Tinney, for **Rickling Kaiser 2nd.**

Class 378.—*Essex Boars, born in* 1933.

3020 I.—F. J. Bosworth, Greens Farm, Magdalen Laver, Ongar, for **Laver Sultan** 4119 (628), born Jan. 20; *s.* Roothing Sultan 2nd 3981, *d.* Laver Clara 21328 *by* Barling Judge 3823.

3021 II.—King's College Farms, Worlaby Hall, Brigg, for **Elsham Sultan** 4121 (629), born Jan. 24; *s.* Tanfield Sultan 3971, *d.* Tanfield Beatrice 2nd 20696 *by* Peace King 3231.

3017 III.—H. S. Ashton, Trueloves, Ingatestone, for **Trueloves Badger** 4103 (622), born Jan. 3; *s.* Tanfield King 2nd 9373, *d.* Trueloves Choice 20750 *by* Barling Neptune 3261.

3018 R.N.—H. S. Ashton, for **Trueloves Balm.**

Class 379.—*Essex Breeding Sows, born in or before* 1931.

3027 I. & Champion.[1]—William Ritchie, Marks Hall, Margaret Roding, Dunmow, for **Roothing Female 6th** 19676 (1854), born Aug. 1, 1928, farrowed Jan. 6; *s.* Peace Kaiser 3233, *d.* Roothing Female 2nd 18718 *by* Tewes Laughter 1953.

3026 II. & R.N. for Champion.[1]—King's College Farms, Worlaby Hall, Brigg, for **Tanfield Concord** 20282 (2052), born Jan. 11, 1929, farrowed Feb. 8, bred by T. H. Sochon, Tanfield Tye, West Hanningfield, Essex; *s.* Peace King 3231, *d.* Ramsey Precious 14714 *by* Barling Sultan 1493.

3028 III.—J. R. Tinney, Church End, Rickling, Newport, Essex, for **Rickling Charlotte 25th** 19938 (1911), born Jan. 29, 1928, farrowed Jan. 25; *s.* Cressing Angus 4th 1985, *d.* Rickling Charlotte 6th 11466 *by* Gosfield Scout 2nd 627.

3024 R.N.—King's College Farms, for **Tanfield Ada 2nd.**
H.C.—3022. C.—3025.

Class 380.—*Essex Sows, born in* 1932.[2]

3031 I.—King's College Farms, Worlaby Hall, Brigg, for **Annie of Elsham** 21518 (2718), born May 6; *s.* Peace King 3231, *d.* Tanfield Annie 18490 *by* Pan Ernest 2693.

3030 II.—H. S. Ashton, Trueloves, Ingatestone, for **Trueloves Aloft** 21232 (2568), born Jan. 2; *s.* Laver Drummer 3659, *d.* Trueloves Maidenhead 19506 *by* Rickling Angus 1st 3015.

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[1] Champion Silver Cup given by the Essex Pig Society for the best Essex Pig.
[2] Prizes given by the Essex Pig Society.

3034 **III.**—J. R. Tinney, Church End, Rickling, Newport, Essex, for **Rickling Empress 22nd** 21212 (1921), born Jan. 3; *s.* Roothing Kaiser 5th 3681, *d.* Rickling Empress 20th 19934 *by* Barling Cadet 2797.
3032 **R.N.**—King's College Farms, for **Annie of Elsham 2nd.**

Class 381.—*Essex Sows, born in* 1933.

3038 **I.**—F. J. Bosworth, Greens Farm, Magdalen Laver, Ongar, for **Laver Cissie** 21514 (2716), born Jan. 15; *s.* Roothing Sultan 2nd 3981, *d.* Laver Cynthia 21330 *by* Barling Judge 3823.
3041 **II.**—William Ritchie, Marks Hall, Margaret Roding, Dunmow, for **Roothing Lilac 14th** 21508 (2713), born Jan. 6; *s.* Trueloves Atom 3847, *d.* Roothing Lilac 6th 20902 *by* Rickling Duke 4th 3581.
3037 **III.**—H. S. Ashton, Trueloves, Ingatestone, for **Trueloves Balance** 21558 (2733), born Jan. 3; *s.* Tanfield King 2nd 3973, *d.* Trueloves Choice 20750 *by* Barling Neptune 3261.
3042 **R.N.**—William Ritchie, for **Roothing Biddy 16th.**
H.C.—3039.

Long White Lop-eared.

Class 382.—*Long White Lop-Eared Boars, born in or before* 1931.

3046 **I., Champion[1] & Champion.[2]**—H. R. Jasper, East Petherwin Farm, South Petherwin, Launceston, for **Trolvis Ben 11th** 2328, born Feb. 3, 1931, bred by Blight Bros., Trolvis Farm, Stithians, Cornwall; *s.* Pennare Trigo 1864, *d.* Trolvis Ruby 50th 5969 *by* Bezurrell Ben 3rd 1606.
3048 **II.**—W. H. Neal, Walreddon Farm, Tavistock, for **Ipplepen Forester** 2156, born July 18, 1930, bred by M. H. Moore, Ipplepen, Devon; *s.* Yealmpstone Sambo 1796, *d.* Ipplepen Pride 4th 6169 *by* Lumburn Leader 2nd 1464.
3049 **III.**—Capt. D. M. Wills, Barley Wood, Wrington, Somerset, for **Ipplepen Don 2nd** 2150, born Dec. 20, 1929, bred by M. H. Moore, Ipplepen, Devon; *s.* Yealmpstone Sambo 1796, *d.* Ipplepen Belle 5421 *by* Axworthy Captain 1370.
3043 **R.N.**—Dartington Hall, Ltd., Clifford Bridge Farm, Drewsteignton, Exeter, for **Ipplepen Hopeful.**

Class 383.—*Long White Lop-Eared Boars, born in* 1932.

3052 **I. & R.N. for Champion.[1]**—W. H. Neal, Walreddon Farm, Tavistock, for **Treringey Captain 2nd** 2494, born Jan. 24, bred by A. H. Johns & Sons, Treringey, Crantock, Cornwall; *s.* Devonshire Ladder 1880, *d.* Trethvas Duchess 4th 5941 *by* Priory Millman 10th 1586.
3051 **II.**—G. H. Eustice, Bezurrell, Gwinear, Hayle, for **Treringey Captain 3rd** 2496, born Jan. 24, bred by A. H. John & Sons, Treringey, Crantock, Cornwall; *s.* Devonshire Ladder 1880, *d.* Trethvas Duchess 4th 5941 *by* Priory Millman 10th 1586.
3053 **III.**—W. J. Westlake, Godwell, Ivybridge, for **Petherwin Lad 1st** 2500, born Feb. 6, bred by H. R. Jasper, South Petherwin, Launceston; *s.* Petherwin Masterpiece 2148, *d.* Petherwin Princess 1st 6535 *by* Yealmpstone Ben 7th 1550.
3050 **R.N.**—Dartington Hall, Ltd., Clifford Bridge Farm, Drewsteignton, Exeter, for **Priory Soloman 17th.**

Class 384.—*Long White Lop-Eared Boars, born in* 1933.

3057 **I.**—T. C. Marshall, Paramount View, Exeter Road, Ivybridge, for **Paramount Duke 5th** 2604, born Jan. 5; *s.* Paramount Superior 2nd 2194, *d.* Paramount Princess 4th 6105 *by* Priory Millman 7th 1216.
3054 **II.**—Dartington Hall, Ltd., Clifford Bridge Farm, Drewsteignton, Exeter, for **Clifford Cavalier** 2584, born Feb. 1; *s.* Prestow Rover 2190, *d.* Clifford Attraction 6760 *by* Ipplepen Hopeful 2106.
3058 **III.**—W. H. Neal, Walreddon Farm, Tavistock, for **Yealmpstone Gay Boy 5th** 2606, born Jan. 10; *s.* Treringey Captain 2nd 2494, *d.* Yealmpstone Beauty 2nd 6747 *by* Yealmpstone Gay Boy 3rd 1992.
3060 **R.N.**—W. J. Westlake, Godwell, Ivybridge, for **Godwell Captain 2nd.**

Class 385.—*Long White Lop-Eared Breeding Sows, born in or before* 1931.

3061 **I., R.N. for Champion[3] & Champion[2].**—G. H. Eustice, Bezurrell, Gwinear, Hayle, for **Bezurrell Alacrity 16th** 6745, born Jan. 3, 1931, farrowed Jan. 20; *s.* Priory Millman 11th 2078, *d.* Bezurrell Alacrity 7th 5851 *by* Afton Gay Boy 1122.

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[1] Champion Silver Medal given by the National Long White Lop-Eared Pig Society for the best Boar.

[2] The "Risingholme" Silver Challenge Cup given through the National Long White Lop-Eared Pig Society for the best Long White Lop-Eared Pig.

[3] Champion Silver Medal given by the National Long White Lop-Eared Pig Society for the best Sow.

3068 II.—W. J. Westlake, Godwell, Ivybridge, for **Godwell Lily 6th 6715**, born Feb. 1, 1931, farrowed Jan. 6; *s.* Devonshire Sportsman 2108, *d.* Godwell Gem 1st 6163 *by* Ipplepen Don 1312.

3062 III.—W. H. Neal, Walreddon Farm, Tavistock, for **Yealmpstone Beauty 2nd 6747**, born Jan. 15, 1931, farrowed Jan. 10; *s.* Yealmpstone Gay Boy 3rd 1992, *d.* Godwell Beauty 8th 4859 *by* Yealmpstone Ben 3rd 938.

Class 386.—*Long White Lop-Eared Sows, born in* 1932.[1]

3067 I. & R.N. for Champion.[2]—T. C. Marshall, Paramount View, Exeter Road, Ivybridge, for **Paramount Princess 7th 7041**, born Jan. 6; *s.* Paramount Superior 2nd 2194, *d.* Paramount Princess 4th 6105 *by* Priory Millman 7th 1216.

3065 II.—G. H. Eustice, Bezurrell, Gwinear, Hayle, for **Treringey Primrose 3rd 7101**, born Jan. 24; *s.* Devonshire Ladder 1880, *d.* Trethvas Duchess 4th 5941 *by* Priory Millman 10th 1586.

3064 III.—Dartington Hall, Ltd., Clifford Bridge Farm, Drewsteignton, Exeter, for **Clifford Blonde 7067**, born Jan. 6; *s.* Prestow Rover 2190, *d.* Clifford Attraction 6769 *by* Ipplepen Hopeful 2106.

3069 R.N.—W. J. Westlake, Godwell, Ivybridge, for **Godwell Duchess 2nd.**

Class 387.—*Long White Lop-Eared Sows, born in* 1933.

3071 I.—Dartington Hall, Ltd., Clifford Bridge Farm, Drewsteignton, Exeter, for **Clifford Countess 7347**, born Jan. 8; *s.* Ipplepen Hopeful 2106, *d.* Lidcutt Vanity 3rd 6383 *by* Lumburn Lad 5th 1732.

3070 II.—Fred J. Baker, Shute, Batson, Salcombe, for **Paramount Princess 10th 7397**, born Jan. 5, bred by T. & C. Marshall, Paramount, Ivybridge; *s.* Paramount Superior 2nd 2194, *d.* Paramount Princess 4th 6105 *by* Priory Millman 7th 1216.

3072 III.—G. H. Eustice, Bezurrell, Gwinear, Hayle, for **Bezurrell Mary 41st 7359**, born Jan. 4; *s.* Afton Gay Boy 1122, *d.* Bezurrell Mary 12th 5893 *by* Yealmpstone Captain 1596.

3076 R.N.—W. J. Westlake, Godwell, Ivybridge, for **Godwell Lily 8th.**

Welsh.

Class 388.—*Welsh Boars, born in* 1932 *or* 1933.

3080 I.—R. Ewart Owen, Tan Lan Hall Home Farm, Prestatyn, for **Prestatyn Peter 6th 94** (D.U. 75), born Aug. 1, 1932; *s.* Treveilyr Peter 58, *d.* Prestatyn Lucy 5th 181 *by* Forest Pattern 17th 57.

3077 II.—Dinam Estates Co., Llandinam Hall Farms, Llandinam, Mont., for **Dinam Horace 79** (B.U. 669), born Aug. 22, 1932; *s.* Prestatyn Premier 60, *d.* Dinam Felicity 2nd 212 *by* Penback Cymro 4th 37.

3078 III.—Dinam Estates Co., for **Dinam Horus 80** (B.U. 656), born Aug. 15, 1932; *s.* Prestatyn Premier 60, *d.* Dinam Gem 148 *by* Peniel Premier 1st 44.

3081 R.N.—R. Ewart Owen, for **Prestatyn Peter 7th.**

H.C.—3079. C.—3082.

Class 389.—*Welsh Breeding Sows, born in or before* 1931.

3086 I.—R. Ewart Owen, Tan Lan Hall Home Farm, Prestatyn, for **Prestatyn Lucy 5th 181** (D.U. 5), born Jan. 2, 1931, farrowed Feb. 16; *s.* Forest Pattern 17th 57, *d.* Hedog Lucy 81 *by* Penback Cymro 34.

3087 II.—R. Ewart Owen, for **Prestatyn Lucy 8th 280** (D.U. 10), born July 4, 1931, farrowed Feb. 20; *s.* Forest Pattern 17th 57, *d.* Hedog Lucy 81 *by* Penback Cymro 34.

3083 III.—Dinam Estates Co., Llandinam Hall Farms, Llandinam, Mont., for **Dinam Dainty 11** (B.U. 127), born Jan. 5, 1928, farrowed Jan. 9; *s.* Gwersyllt Masterpiece 12th 294, *d.* Dinam Cosmea 5103 *by* Dolanog Prince David 2nd 312 W.

3085 R.N.—Dinam Estates Co., for **Dinam Ethel.**

H.C.—3088.

Class 390.—*Welsh Sows, born in* 1932.[3]

3091 I.—Dinam Estates Co., Llandinam Hall Farms, Llandinam, Mont., for **Prestatyn Lucy 11th 202** (D.U. 40), born Jan. 4, bred by R. Ewart Owen, Tan Lan Hall Home Farm, Prestatyn; *s.* Forest Pattern 17th 57, *d.* Hedog Lucy 81 *by* Penback Cymro 34.

3098 II.—R. Ewart Owen, Tan Lan Hall Home Farm, Prestatyn, for **Prestatyn Flame 268** (D.U. 84), born Aug. 1; *s.* Treveilyr Peter 58, *d.* Prestatyn Lucy 5th 181 *by* Forest Pattern 17th 57.

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[1] Prizes given by the National Long White Lop-Eared Pig Society.

[2] Champion Silver Medal given by the National Long White Lop-Eared Pig Society for the best Sow.

[3] Prizes given by the National Welsh Pig Society.

3094 **III.**—R. Ewart Owen, for **Prestatyn Megan 1st 265** (D.U. 25), born Jan. 3; *s.* Forest Pattern 17th 57, *d.* Prestatyn Lucy 5th 181 *by* Forest Pattern 17th 57.
3090 **R.N.**—Dinam Estates Co., for **Dinam Hawthorn.**
H.C.—3089. **C.**—3092.

Class 391.—*Welsh Sows, born in* 1933.

3101 **I.**—Mrs. Williams-Owen, Treveilyr, Bodorgan S.O., Anglesey, for **Treveilyr Juniper 5th 273** (J. 78), born Jan. 8; *s.* Peniel Premier 1st 44, *d.* Treveilyr Juniper 187 *by* Gwersyllt Masterpiece 7th 290.
3100 **II.**—R. Ewart Owen, Tan Lan Hall Home Farm, Prestatyn, for **Prestatyn Gay Lady 2nd 282** (D.U. 108), born Jan. 15; *s.* Derwen Gay Boy 64, *d.* Prestatyn Megan 1st 265 *by* Forest Pattern 17th 57.
3097 **III.**—Dinam Estates Co., Llandinam Hall Farms, Llandinam, Mont., for **Dinam Impartial 288** (B.U. 687), born Jan. 2; *s.* Forest Pattern 17th 57, *d.* Dinam Ethel 27 *by* Penback Cymro 4th 37.
3098 **R.N.**—Dinam Estates Co., for **Dinam Indicative.**
H.C.—3096. **C.**—3099.

Bacon Pigs.

Class 392.—*Two Bacon Pigs of any Pure Breed, above* 180 *lb. and not exceeding* 230 *lb. each live weight.*

3102 **I.**—H. R. Davidson, 11, Milton Road, Harpenden, Herts. (Large White.)
3117 **II.**—Alfred W. White, Hillegom, Spalding, Lincs. (Large White.)
3109 **III.**—Ernest Harding, Packwood Grange, Dorridge, Birmingham. (Large White.)
3114 **IV.**—R. Ewart Owen, Tan Lan Hall Home Farm, Prestatyn. (Welsh.)
3107 **V.**—J. Onslow Fane, Steventon Manor, Hants. (Large White.)
3106 **R.N.**—Dinam Estates Co., Llandinam Hall Farms, Llandinam, Mont. (Welsh.)

Class 393.—*Two Bacon Pigs, First Cross between any Pure Breeds, above* 180 *lb. and not exceeding* 230 *lb. each live weight.*

3126 **I.**, 3127 **II.** and 3125 **R.N.**—T. L. Ward, Cokhay, Repton, Derby. (*s.* Large White, *d.* Large Black.)
3128 **III.**—S. Owen Webb, Streetly Hall, West Wickham, Cambs. (*s.* Large White, *d.* Large Black.)
3121 **IV.**—Frank William Gilbert, The Manor, Chellaston, Derby. (*s.* Wessex Saddleback, *d.* Large White.)

Porkers.

Class 394.—*Two Porkers of any Pure Breed, above* 100 *lb. and not exceeding* 140 *lb. each live weight.*

3138 **I.** and 3137 **IV.**—P. W. Hull, The Knowle, Hazlewood, Derby. (Middle White.)
3139 **II.**—John Pierpont Morgan, Wall Hall, Watford. (Large White.)
3143 **III.**—Lt.-Col. C. J. H. Wheatley, Berkswell Hall, Berkswell, Coventry. (Tamworth.)
3142 **R.N.**—Lt.-Col. H. J. Stibbard, O.B.E., Chiseldon Camp, Wiltshire. (Large White.)

Class 395.—*Two Porkers, First Cross between any Pure Breeds, above* 100 *lb. and not exceeding* 140 *lb. each live weight.*

3157 **I.**—Lt.-Col. C. J. H. Wheatley, Berkswell Hall, Coventry. (*s.* Tamworth, *d.* Large White.)
3151 **II.**—Lt.-Col. H. J. Stibbard, O.B.E., Chisledon Camp, Wiltshire. (*s.* Large White, *d.* Middle White.)
3153 **III.**—T. L. Ward, Cokhay, Repton, Derby. (*s.* Large White, *d.* Large Black.)
3148 **IV.**—H. R. Davidson, 11, Milton Road, Harpenden, Herts. (*s.* Wessex Saddleback, *d.* Large White.)
3156 **R.N.**—S. Owen Webb, Streetly Hall, West Wickham, Cambs. (*s.* Large White, *d.* Large Black.)

POULTRY.

By "Cock" and "Hen" are meant birds hatched previous to January 1, 1933; and by "Cockerel" and "Pullet" are meant birds hatched in 1933.

The Prizes in each Class are as follows: **First Prize, 30s.; Second Prize, 20s.; Third Prize, 10s.; Fourth Prize, 5s.**

Special Prizes were given in the Poultry Classes by the following Clubs: Croad Langshan, Sussex, Columbian Wyandotte, Buff Orpington, British Black Barnevelder, British Barnevelder, Welsummer, and Plymouth Rock.
"P.F." stands for "Poultry Farm."

Class 396.—*Dorking Cocks or Cockerels.*

4 I.—W. G. Watson, Rusper Road, Horsham.
2 II and 6 III.—A. J. Major, Ditton, Langley, Bucks.
7 IV.—Samuel Oatey, Chacewater, Truro.
1 R.N.—John Meikle, Camregan, Girvan.
H.C.—5.

Class 397.—*Dorking Hens or Pullets.*

12 I and 9 IV.—A. J. Major, Ditton, Langley, Bucks.
13 II.—W. G. Watson, Rusper Road, Horsham.
10 III.—John Meikle, Camregan, Girvan.
11 R.N.—Samuel Oatey, Chacewater, Truro.
H.C.—8.

Class 398.—*Croad Langshan Cocks or Cockerels.*

17 I. & Special.—Dr. W. P. Grellet, Orford Lodge, Hitchin.
14 II. & R.N. for Special.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
16 III.—Joe Farnsworth, Mount Pleasant P.F., Bleasby, Nottingham.
18 IV.—R. Anthony, Euxton, Chorley, Lancs.
19 R.N.—Harry Abbot, Live Stock Farms, Thuxton, Norfolk.
H.C.—15.

Class 399.—*Croad Langshan Hens or Pullets.*

24 I. & Special.—R. Anthony, Euxton, Chorley, Lancs.
20 II. & R.N. for Special.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
25 III and 21 R.N.—Mrs. E. Mills, Woodford Hall, Milton Damarel, Devon.
23 IV.—Dr. W. P. Grellet, Orford Lodge, Hitchin.
H.C.—22.

Class 401.—*Brahma or Cochin Hens or Pullets.*

30 I.—R. Anthony, Euxton, Chorley, Lancs.
28 II.—R. Jackson, Garden Park, Miller Road, Ayr.
26 III.—H. Hough-Watson, Braystones House, Beckermet.
29 IV.—T. A. Hargreaves, 9, Norfolk Road, Lytham.
27 R.N.—Rhys Llewellyn, St. Fagans Court, Glam.

Class 402.—*Red Sussex Cocks.*

31 I. & Special, 33 II., 32 III., 34 IV.—J. Dumbleton, Sheen Croft Farm, Didcot, Berks.

Class 403.—*Red Sussex Hens.*

35 I. & R.N. for Special, 36 II., 37 III and 38 IV.—J. Dumbleton, Sheen Croft Farm, Didcot, Berks.

Class 404.—*Red Sussex Cockerels.*

40 I.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
39 II., 43 III and 41 IV.—J. Dumbleton, Sheen Croft Farm, Didcot, Berks.

Class 405.—*Red Sussex Pullets.*

44 I and 47 IV.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
45 II and 48 III.—J. Dumbleton, Sheen Croft Farm, Didcot, Berks.

Class 406.—*Light Sussex Cocks.*

50 I., Special & Cup,[1] 52 II. and 54 III.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
53 IV.—J. S. Worsley, The Cottage, Thornaby Village, Yorks.

Class 407.—*Light Sussex Hens.*

57 I. and 59 III.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
56 II.—Col. D. A. Clayton, Pooley Hall, Polesworth, Tamworth.
58 IV.—R. Anthony, Euxton, Chorley, Lancs.
55 R.N.—R. C. Harbottle, Albion House, Great Ayton, Yorks.

Class 408.—*Light Sussex Cockerels.*

61 I. & R.N. for Special & Cup[1] and 64 IV.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
63 II. and 60 III.—Henry Underwood, Mowshurst P.F., Edenbridge.
62 R.N.—Col. D. A. Chaytor, Pooley Hall, Polesworth, Tamworth.

Class 409.—*Light Sussex Pullets.*

65 I. and 71 III.—Henry Underwood, Mowshurst P.F., Edenbridge.
68 II.—Col. D. A. Chaytor, Pooley Hall, Polesworth, Tamworth.
70 IV.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
69 R.N.—Lees Platt, 145, Manchester Road, Mossley, Manchester.
H.C.—67.

Class 411.—*Speckled Sussex Hens.*

73 I. & Special.—Sir Herbert Sharp, Bart., Morley Poultry Farm, Hasketon, Woodbridge.
72 II. and 75 III.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
74 IV.—Capt. the Hon. C. K. Greenway, Stanbridge Earls P.F., Romsey, Hants.

Class 412.—*Speckled Sussex Cockerels.*

77 I. & R.N. for Special and 79 IV.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
76 II. and 80 R.N.—Capt. T. M. Whittaker, Pen-y-Bryn, Portmadoc.
78 III.—Capt. the Hon. C. K. Greenway, Stanbridge Earls P.F., Romsey, Hants.

Class 413.—*Speckled Sussex Pullets.*

84 I.—Capt. the Hon. C. K. Greenway, Stanbridge Earls P.F., Romsey, Hants.
82 II. and 86 IV.—Capt. T. M. Whittaker, Pen-y-Bryn, Portmadoc.
89 III.—Sir Herbert Sharp, Bart., Morley P.F., Hasketon, Woodbridge.
87 R.N.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
H.C.—85.

Class 415.—*White Sussex Hens or Pullets.*

91 I. & Special and 93 III.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
92 II. and 94 IV.—Francis J. Marston, Biddenden P.F., Biddenden, Kent.

Class 418.—*White Wyandotte Cocks or Cockerels.*

99 I.—T. P. Burwell, Orchards, Milton Bryan, Bletchley.
97 II.—G. Blundell, Newstead, Catforth, Preston.
100 III.—R. P. Harbottle, Albion House, Great Ayton, Yorks.
96 IV.—F. J. Ainscough, Briars Hall, Lathom, Ormskirk.
102 R.N.—Hugh Gunn, Enville, Pirton Lane, Churchdown, Glos.
H.C.—98.

Class 419.—*White Wyandotte Hens or Pullets.*

107 I.—F. J. Ainscough, Briars Hall, Lathom, Ormskirk.
104 II.—R. P. Harbottle, Albion House, Great Ayton, Yorks.
109 III.—T. P. Burwell, Orchards, Milton Bryan, Bletchley.
108 IV.—Hugh Gunn, Enville, Pirton Lane, Churchdown, Glos.
110 R.N.—G. Blundell, Newstead, Catforth, Preston.

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[1] The "Crawshay Memorial" Cup and a Special Prize given through the Sussex Poultry Club for the best Light Sussex.

Class 421.—*Gold or Silver Laced Wyandotte Hens or Pullets.*

114 I.—W. Mayer, Biddulph Park, Stoke-on-Trent.
112 II and 116 III.—F. R. Maskery, 58, St. Edward Street, Leek.
115 IV.—M. Broughton, Meadowside, Lacey Green, Wilmslow.
113 R.N.—H. & N. Grimshaw, Little Browns P.F., Edenbridge.

Class 422.—*Columbian Wyandotte Cocks or Cockerels.*

118 I. & Cup.[1]—W. A. Slocock, Goldsworth Orchard, St. Johns, Woking.
119 II. and 121 III.—Fred Brown, Woodside, Grimscar, Huddersfield.
120 R.N.—R. Matterface, 121, South Street, Bridport.

Class 423.—*Columbian Wyandotte Hens or Pullets.*

125 I., R.N. for Cup[1] & Spoon[1] and 123 III.—Fred Brown, Woodside, Grimscar, Huddersfield.
122 II. & R.N. for Spoon.[1]—W. A. Slocock, Goldsworth Orchard, St. Johns, Woking.
124 IV.—R. Matterface, 121, South Street, Bridport.

Class 424.—*Wyandotte Cocks or Cockerels, any other colour.*

130 I.—W. H. Leeson, 91, Harnall Lane East, Coventry.
134 II.—Roger Hargreaves, Abbeydene P.F., Whalley, Lancs.
131 III.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
133 IV.—Harry Fox, International P.F., Matlock.
H.C.—136. C.—129.

Class 425.—*Wyandotte Hens or Pullets, any other colour.*

139 I.—Roger Hargreaves, Abbeydene P.F., Whalley, Lancs.
142 II.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
143 III.—W. H. Leeson, 91, Harnall Lane East, Coventry.
141 IV.—John Wharton, Honeycott Farm, Hawes, Yorks.
137 R.N.—H. Whitley, Primley, Paignton.
H.C.—140.

Class 426.—*Buff Orpington Cocks or Cockerels.*

145 I. & Special.—F. Watkin-Warner, 54, Reigate Road, Ewell, Surrey.
148 II.—W. H. Cook (Orpington), Cook's P.F., Orpington.
149 III.—Alex. Reith, Barbieston Cottage, Dalrymple.
144 IV.—Mrs. J. McClure, The Pear Tree P.F., Hillingdon, Middlesex.
146 R.N.—W. Evans, Britannia P.F., Coppenhall, Crewe.

Class 427.—*Buff Orpington Hens or Pullets.*

155 I. & R.N. for Special.—Alex. Reith, Barbieston Cottage, Dalrymple.
150 II.—E. E. Garrod, Orpington P.F., Felixstowe Road, Ipswich.
154 III.—W. H. Cook (Orpington), Cook's P.F., Orpington.
153 IV.—E. & P. Ainley, Ferndale P.F., Verandah Lodge, Horley.

Class 428.—*Black Orpington Cocks or Cockerels.*

157 I. and 162 III.—John Burdett, 1, Lake Bank Terrace, Wingate.
156 II.—Fred Swindells, Diglake Farm, Buglawton, Cheshire.
159 IV.—R. Anthony, Euxton, Chorley, Lancs.
160 R.N.—Morris Bros., No. 2 Talybont, near Bangor.
H.C.—161.

Class 429.—*Black Orpington Hens or Pullets.*

166 I.—R. Anthony, Euxton, Chorley, Lancs.
168 II.—John Burdett, 1, Lake Bank Terrace, Wingate.
167 III.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
169 IV.—Fred Swindells, Diglake Farm, Buglawton, Cheshire.
165 R.N.—Miss N. Shanks, Stetchworth, Newmarket.

Class 430.—*Orpington Cocks or Cockerels, any other colour.*

172 I.—J. D. Kay, Stetchworth, Newmarket.
174 II.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
177 III.—W. H. Cook (Orpington), Cook's P.F., Orpington.
175 IV. and 178 R.N.—H. Whitley, Primley, Paignton.
C.—176.

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[1] The "Goddard" Visiting Cup given by the Columbian Wyandotte Club for the best Columbian Wyandotte, and Silver Spoon for the best Columbian Wyandotte of opposite sex.

Class 431.—*Orpington Hens or Pullets, any other colour.*

184 I. and 180 IV.—Tom Trigg, The Oaks, Anthill, Denmead, Portsmouth.
183 II.—J. D. Kay, Stetchworth, Newmarket.
186 III.—W. H. Cook (Orpington), Cook's P.F., Orpington.
182 R.N.—E. & P. Ainley, Ferndale P.F., Verandah Lodge, Horley.

Class 432.—*Australorp Cocks or Cockerels.*

189 I.—J. H. Beever, Wansford, Driffield.
190 II.—J. W. Fawcett, 7, Mann Square, Thurnscoe, Rotherham.
193 III.—J. T. Leggott, Holme-on-Spalding Moor, York.
194 IV.—Arthur F. Cumberbirch, Broomcroft, Goostrey, Holmes Chapel.
192 R.N.—Mrs. W. A. Reeves, Norton Ferris, Kilmington, Frome.
H.C.—191. C.—187.

Class 433.—*Australorp Hens or Pullets.*

197 I. and 203 R.N.—J. E. H. Venning, Trefrank, St. Clether, Launceston.
201 II.—J. H. Beever, Wansford, Driffield.
196 III.—Mrs. A. M. Pape, Shrewton House P.F., Shrewton, Wilts.
199 IV.—Mrs. M. Mugeli, Marsden House, High Lane, Stockport.
H.C.—202.

Class 434.—*British Jersey Giant Cocks or Cockerels.*

207 I.—Chas. Leedham, Temple Gardens, Nuttall, Nottingham.
205 II.—Mrs. Violet Miller, The Grange, Muckhart, Dollar.
209 III.—T. R. Blackhurst, County Hotel, Lancaster.
208 IV.—D. J. Insley, Hunstanton, Norfolk.
211 R.N.—J. Pickerill, Moorside, Madeley, Crewe.
H.C.—206.

Class 436.—*Black Barnevelder Cocks or Cockerels.*

212 I. & Special.—R. Fletcher Hearnshaw, Burton Joyce, Nottingham.
213 II.—Mrs. M. Swales-Johnson, Evendon Lodge, Wokingham.
215 III.—Tom Clough, The P.F., Gawsworth, Cheshire.
H.C.—222. C.—217, 221.

Class 437.—*Black Barnevelder Hens or Pullets.*

225 I. & Special.—Mrs. G. B. Huntington, Wellesbourne House, Warwick.
226 II & R.N. for Special.—Harry Fox, International P.F., Matlock.
228 III.—Tom Clough, The P.F., Gawsworth, Cheshire.
227 IV.—Walter C. Payne, The Chalet, Weston, Hitchin.
H.C.—224, 229. C.—231.

Class 438.—*Barnevelder Cocks or Cockerels, any other colour.*

236 I. & Special.—William Foote, Fir Tree Bungalow, Snow Hill, Crawley Down.
234 II.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
235 III. and 240 IV.—Mrs. M. Swales-Johnson, Evendon Lodge, Wokingham.
H.C.—233, 241. C.—239.

Class 439.—*Barnevelder Hens or Pullets, any other colour.*

245 I. & R.N. for Special.—J. E. Frankcom, Salem, Barton Lane, New Milton, Hants.
246 II.—Mrs. M. Swales-Johnson, Evendon Lodge, Wokingham.
243 III.—George Vardy, Pennock Hiron, Belper, Derby.
248 IV.—William Foote, Fir Tree Bungalow, Snow Hill, Crawley Down.
244 R.N.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
H.C.—252, 255. C.—253.

Class 440.—*Welsummer Cocks or Cockerels.*

268 I., Special & Cup.[1]—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
258 II. & R.N. for Special & Cup.[1]—R. Fletcher Hearnshaw, Burton Joyce, Nottingham.
262 III.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
267 IV.—Mrs. A. M. Pape, Shrewton P.F., Shrewton, Wilts.
274 R.N.—W. Cecil Robinson, Inglefield, Dean Row, Wilmslow.
H.C.—263, 271. C.—257, 270.

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[1] The Welsummer Visiting Cups given by the Welsummer Club for the best Male and best Female.

Class 441.—*Welsummer Hens or Pullets.*

287 I., Special & Cup.[1]—Roger Hargreaves, Abbeydene P.F., Whalley, Lancs.
294 II. & R.N. for Special & Cup.[1]—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
283 III.—Grellet & Moss, 23, Lancaster Road, Hitchin.
276 IV. and 286 R.N.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
H.C.—277, 281, 288. C.—292, 293.

Class 442.—*Rhode Island Red Cocks.*

299 I.—W. R. Abbey & Son, Croft Farm, Hessay, York.
311 II. and 308 III.—Richard Moore, Hammer House, Sutton Bridge, Wisbech.
310 IV.—H. Whitley, Primley, Paignton.
302 R.N.—Frank H. Page, Woodlands, Great Horkesley, Colchester.
H.C.—298, 303, 304. C.—300.

Class 443.—*Rhode Island Red Hens.*

314 I.—Frank H. Page, Woodlands, Great Horkesley, Colchester.
318 II.—G. Exelby, 97, Poppleton Road, York.
316 III.—J. G. Williamson, Chester Road, Middlewich.
315 IV.—Capt. the Hon. C. K. Greenway, Stanbridge Earls P.F., Romsey, Hants.
317 R.N.—G. H. Muzzlewhite, Redlands, Tavistock.
H.C.—321. C.—320.

Class 444.—*Rhode Island Red Cockerels.*

324 I.—Capt. the Hon. C. K. Greenway, Stanbridge Earls P.F., Romsey, Hants.
330 II. and 333 R.N.—Richard Moore, Hammer House, Sutton Bridge, Wisbech.
325 III.—W. R. Abbey & Son, Croft Farm, Hessay, York.
327 IV.—William Hamnett, Myrtle P.F., Blackpool.
H.C.—331.

Class 445.—*Rhode Island Red Pullets.*

346 I.—Richard Moore, Hammer House, Sutton Bridge, Wisbech.
349 II.—Arthur Jordan, Measham, Burton-on-Trent.
335 III.—W. R. Abbey & Son, Croft Farm, Hessay, York.
334 IV.—Mrs. C. A. Dennett, West Lodge, Woodthorpe Drive, Nottingham.
338 R.N.—Capt. the Hon. C. K. Greenway, Stanbridge Earls P.F., Romsey, Hants.
H.C.—343. C.—337, 345.

Class 446.—*Barred Plymouth Rock Cocks.*

357 I. & R.N. for Special.—James Lewis, 25, Church Street, Old Whittington, Chesterfield.
362 II.—D. Davies, Glyn Aur, Abergwili, Carmarthen.
354 III.—R. Anthony, Euxton, Chorley, Lancs.
359 IV.—E. W. Allenby, Three Oaks, Virginia Water.
358 R.N.—Lionel Dean, Hazeldene, Newmill, Huddersfield.
H.C.—361. C.—355.

Class 447.—*Barred Plymouth Rock Hens.*

364 I. & Special.—W. W. W. Butt, Eastfield P.F., North Thoresby.
363 II.—T. H. Nelson, Kirkby Lonsdale.
366 III.—R. Anthony, Euxton, Chorley, Lancs.
365 IV.—Mrs. W. G. Jacka, Ninnis, Germoe, Marazion.

Class 448.—*Barred Plymouth Rock Cockerels.*

367 I.—Henry Bickerstaff, Hornby Hall, Lancaster.
372 II.—J. Fawcett, Eldron House, Ingleton, Carnforth.
371 III.—George Woodiwiss, Lindeth Lodge, Silverdale, Carnforth.
374 IV.—Penpraze Bros., Trevingey House, Redruth.
369 R.N.—Lionel Dean, Hazeldene, Newmill, Huddersfield.
H.C.—370.

Class 449.—*Barred Plymouth Rock Pullets.*

379 I.—George Woodiwiss, Lindeth Lodge, Silverdale, Carnforth.
380 II.—J. Fawcett, Eldron House, Ingleton, Carnforth.
383 III.—F. S. Williams, Cofton P.F., Northfield, Birmingham.
375 IV.—Henry Bickerstaff, Hornby Hall, Lancaster.
377 R.N.—T. H. Nelson, Kirkby Lonsdale.
H.C.—378. C.—376.

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[1] The Welsummer Visiting Cups given by the Welsummer Club for the best Male and best Female.

Class 450.—*Buff Plymouth Rock Cocks or Cockerels.*

390 I.—H. J. Screech, North Street, Wiveliscombe.
384 II.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
392 III.—E. W. Allenby, Three Oaks, Virginia Water.
389 IV.—John Healey, Kiln Bank Croft, Market Drayton.
386 R.N.—Howard Page, The Cedars, Great Horkesley, Colchester.
H.C.—391.

Class 451.—*Buff Plymouth Rock Hens or Pullets.*

395 I.—W. W. W. Butt, Eastfield P.F., North Thoresby.
394 II.—Bilsborough & Bland, Park Lane P.F., Forton, Preston.
393 III.—Thomas Atkinson, Croft P.F., Burton-in-Lonsdale, Carnforth.
396 IV.—T. Rhead, 22, Duke Street, Leek.

Class 452.—*Plymouth Rock Cocks or Cockerels, any other colour.*

402 I. & Special.—W. W. W. Butt, Eastfield P.F., North Thoresby.
403 II.—John Wharton, Honeycott Farm, Hawes, Yorks.
405 III.—R. Anthony, Euxton, Chorley, Lancs.
401 IV.—Hugh Gunn, Enville, Pirton Lane, Churchdown, Glos.
399 R.N.—John Lewis, Manordilo, Gorslas, Llanelly.
H.C.—400.

Class 453.—*Plymouth Rock Hens or Pullets, any other colour.*

411 I. & R.N. for Special.—John Wharton, Honeycott Farm, Hawes, Yorks.
410 II.—W. W. W. Butt, Eastfield P.F., North Thoresby.
409 III.—John Lewis, Manordilo, Gorslas, Llanelly.
407 IV.—W. R. Abbey & Son, Croft Farm, Hessay, York.
408 R.N.—Arthur Cooke, Creamhaven, 25, Halmergate, Spalding.

Class 454.—*Old English Game Black-Red Cocks or Cockerels.*

421 I.—J. H. Moorhouse, Kitson Hill, Mirfield.
414 II.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
416 III.—Capt. C. W. Wilson, Kirkland House, Wigton.
419 IV.—A. Slater, The Old Vicarage, Lythe, Whitby.
418 R.N.—John Jones, The Laurels, Kendon, Crumlin, Mon.
H.C.—417. C.—415.

Class 455.—*Old English Game Clay or Wheaten Hens or Pullets.*

428 I. and 424 IV.—Capt. C. W. Wilson, Kirkland House, Wigton.
430 II.—J. H. Moorhouse, Kitson Hill, Mirfield.
427 III.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
426 R.N.—William Telford, Breconside, Brampton.
H.C.—429. C.—431.

Class 456.—*Old English Game Cocks or Cockerels, any other colour.*

445 I.—John Jones, The Laurels, Kendon, Crumlin, Mon.
437 II.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
442 III. and 435 IV.—Capt. C. W. Wilson, Kirkland House, Wigton.
443 R.N.—A. Pegg, The Lodge, Ticknall, Derby.
H.C.—434, 444. C.—439, 440.

Class 457.—*Old English Game Hens or Pullets, any other colour.*

454 I.—H. Whitley, Primley, Paignton.
456 II.—J. H. Moorhouse, Kitson Hill, Mirfield.
457 III.—Harry Fox, International P.F., Matlock.
452 IV.—William Telford, Breconside, Brampton.
453 R.N.—Capt. C. W. Wilson, Kirkland House, Wigton.
H.C.—450, 455. C.—446, 448.

Class 458.—*Indian Game Cocks or Cockerels.*

467 I.—H. Whitley, Primley, Paignton.
458 II.—J. H. Baker & Son, Windyash, Barnstaple.
462 III.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
463 IV.—W. E. Platten, Hill Farm, Little Ryburgh, Fakenham.
461 R.N.—W. W. Whiteman, Abbots Lodge, Sandhurst, Gloucester.
H.C.—460, 464.

Class 459.—*Indian Game Hens or Pullets.*

473 I.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
481 II.—A. Pegg, The Lodge, Ticknall, Derby.
471 III.—Cecil Brent, Clampit, Callington, Cornwall.
478 IV.—W. G. Brent, Warrens Park, Congdon Shop, Launceston.
477 R.N.—K. J. G. Hawkey, Treharrock, Wadebridge.
H.C.—474.

Class 460.—*Faverolle Cocks or Cockerels.*

484 I. and 488 II.—Mrs. G. B. Huntington, Wellesbourne House, Warwick.
487 III. and 491 R.N.—Dr. T. W. E. Royden, Fleggburgh, Norfolk.
489 IV.—H. W. Biddlecombe, Prestberries, Hartpury, Gloucester.
H.C.—493.

Class 461.—*Faverolle Hens or Pullets.*

494 I.—Dr. T. W. E. Royden, Fleggburgh, Norfolk.
497 II., 505 III. and 501 IV.—Mrs. G. B. Huntington, Wellesbourne House, Warwick.

Class 462.—*Minorca Cocks or Cockerels.*

509 I.—H. J. Rice, Dairy Farm, Measham, Burton-on-Trent.
507 II.—B. W. Bonas, Measham, Burton-on-Trent.
508 III.—S. E. Parker, 466, Bloxwich Road, Leamore, Walsall.
506 IV.—William J. Sewell, Gateletts, Culgaith, Penrith.

Class 463.—*Minorca Hens or Pullets.*

511 I.—James Anderson, Kirkhall, Ardrossan, Ayrshire.
517 II.—H. E. Sheldon, 82, Curzon Street, Long Eaton.
514 III.—B. W. Bonas, Measham, Burton-on-Trent.
513 IV.—William J. Sewell, Gateletts, Culgaith, Penrith.
515 R.N.—S. E. Parker, 466, Bloxwich Road, Leamore, Walsall.

Class 464.—*Leghorn Cocks or Cockerels.*

520 I.—Ernest Ll. Simon, Kingsmead, Stoke Row, Henley-on-Thames.
526 II.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
518 III.—R. Anthony, Euxton, Chorley, Lancs.
521 IV.—Mrs. R. Graham, Wallacetown Cottages, Gasstown, Dumfries.
527 R.N.—R. W. Keen, Castel Eden, Co. Durham.
H.C.—525. C.—519.

Class 465.—*Leghorn Hens or Pullets.*

531 I.—R. P. Harbottle, Albion House, Great Ayton, Yorks.
536 II. and 529 IV.—R. Anthony, Euxton, Chorley, Lancs.
532 III.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
530 R.N.—Mrs. R. Graham, Wallacetown Cottages, Gasstown, Dumfries.
H.C.—535.

Class 466.—*Ancona Cocks or Cockerels.*

543 I.—R. Anthony, Euxton, Chorley, Lancs.
538 II.—A. Rice, Wollaston, Wellingborough.
542 III.—J. H. Baker & Son, Windyash, Barnstaple.
539 IV.—T. Davies, Llainddelw, Llandyssul.
541 R.N.—E. A. Stephens, Place, Portscatho, Cornwall.
H.C.—537.

Class 467.—*Ancona Hens or Pullets.*

547 I.—A. Rice, Wollaston, Wellingborough.
548 II.—R. Anthony, Euxton, Chorley, Lancs.
550 III.—W. H. Bosley, The Cottage, Hindlow, Buxton.
549 IV.—George Goodall, Christleton, Chester.
545 R.N.—T. Davies, Llainddelw, Llandyssul.
H.C.—551. C.—544.

Class 468.—*Redcap Cocks or Cockerels.*

553 I. and 560 II.—Harry Fox, International P.F., Matlock.
566 III.—James Fox, 2, Undercliff, Bakewell.
563 IV.—R. B. Skidmore, Buxton Road, Bakewell.
569 R.N.—W. H. Baker, School House, Tideswell, Buxton.
H.C.—552, 558, 567. C.—554, 564.

Class 469.—*Redcap Hens or Pullets.*

577 I.—Capt. T. S. Wragg, Edensor, Bakewell.
593 II.—Harry Fox, International P.F., Matlock.
587 III.—James Fox, 2, Undercliff, Bakewell.
580 IV.—H. Heath, Pickwell P.F., Bakewell.
579 R.N.—G. Thompson, Matlock Street, Bakewell.
H.C.—570, 576. C.—572, 585.

Class 472.—*White Silkie Cocks or Cockerels.*

598 I.—Mrs. Humphrey Watts, Haslington Hall, Crewe.
596 II.—Mrs. E. S. Fentiman, 186, Whitworth Road, Swindon.
595 III.—Robert L. Fairley, Lahana, Whitehouse Road, Cramond Bridge.
600 IV.—Misses Davidson & Chisholm, Maisonette, Mont Cochon, Jersey.
599 R.N.—Mrs. A. M. Hall, The Gables, Ruyton-XI-Towns, Shrewsbury.
H.C.—597.

Class 473.—*White Silkie Hens or Pullets.*

609 I.—Misses Davidson & Chisholm, Maisonette, Mont Cochon, Jersey.
608 II.—Mrs. Humphrey Watts, Haslington Hall, Crewe.
602 III.—R. Anthony, Euxton, Chorley, Lancs.
605 IV.—Mrs. A. M. Hall, The Gables, Ruyton-XI-Towns, Shrewsbury.
603 R.N.—Robert L. Fairley, Lahana, Whitehouse Road, Cramond Bridge.
H.C.—607, 613. C.—604.

Class 474.—*Silkie Cocks, Cockerels, Hens or Pullets, any other colour.*

614 I. and 619 II.—David Draper, 99, Boundary Road, London, N.W.8.
611 III.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
618 IV.—Robert L. Fairley, Lahana, Whitehouse Road, Cramond Bridge.
615 R.N.—Mrs. E. S. Fentiman, 186, Whitworth Road, Swindon.
H.C.—613. C.—621.

Class 475.—*Cocks, any other distinct variety, except Bantams.*

625 I.—R. Fletcher Hearnshaw, Burton Joyce, Nottingham. Scots Grey.
629 II.—G. Firth, 10, Straits Lane, Read, Burnley. Modern Game.
622 III.—John Jones, The Laurels, Kendon, Crumlin, Mon. Modern Game.
623 IV.—H. Hough-Watson, Braystones House, Beckermet. Polish.
624 R.N.—C. N. Belbin, Nortonthorpe Hall, Huddersfield. Modern Pile.
H.C.—628, 630. C.—627.

Class 476.—*Hens, any other distinct variety, except Bantams.*

637 I.—Joseph King, West Lane Mills, Keighley. Hamburgh.
639 II.—J. Pickerill, Moorside, Madeley, Crewe. Black Langshan.
633 III.—H. Hough-Watson, Braystones House, Beckermet. Polish.
632 IV.—R. Fletcher Hearnshaw, Burton Joyce, Nottingham. Scots Grey.
634 R.N.—Charles Hargreaves, Cow Hey Farm, Great Harwood, Blackburn. Andalusian.
H.C.—631. C.—638.

Class 477.—*Cockerels, any other distinct variety, except Bantams.*

644 I.—J. H. Baker & Son, Windyash, Barnstaple. Malay.
641 II.—Major G. T. Williams, Tredrea, Perranwell. Frizzle.
645 III.—Major G. T. Williams. Polish.
643 IV.—J. W. Parkin, High Cross Farm, Mickleton, Yorks. Old English Pheasant Fowl.

Class 478.—*Pullets, any other distinct variety, except Bantams.*

650 I.—J. Pickerill, Moorside, Madeley, Crewe. Black Langshan.
647 II.—H. Hough-Watson, Braystones House, Beckermet. Polish.
648 III.—J. H. Baker & Son, Windyash, Barnstaple. Malay.
651 IV.—Major G. T. Williams, Tredrea, Perranwell. Polish.
646 R.N.—Major G. T. Williams. Frizzle.

Class 479.—*White Wyandotte Utility Cocks or Cockerels.*

660 I. and 656 R.N.—Hugh Gunn, Enville, Pirton Lane, Churchdown, Glos.
652 II.—William Hamnett, Myrtle P.F., Blackpool.
657 III.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
658 IV.—G. Blundell, Newstead, Catforth, Preston.
H.C.—654, 663.

Class 480.—*White Wyandotte Utility Hens or Pullets.*

665 I.—William Hamnett, Myrtle P.F., Blackpool.
667 II.—R. Anthony, Euxton, Chorley, Lancs.
674 III.—T. G. Marples, Riddings Farm, Curbar, Sheffield.
675 IV.—Vincent D. Kelaart, Nortondown Egg Farm, Stratton-on-Fosse, Bath.
673 R.N.—John Kay, Carlisle Place, Edenfield, Manchester.
H.C.—666, 671. C.—669, 670.

Class 481.—*White Leghorn Utility Cocks or Cockerels.*

681 I.—Gerald O. Gardner, Trees, Gosmore Road, Hitchin.
680 II.—R. Anthony, Euxton, Chorley, Lancs.
678 III.—William Hamnett, Myrtle P.F., Blackpool.
683 IV.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe.
685 R.N.—T. R. Blackhurst, County Hotel, Lancaster.
H.C.—687. C.—679.

Class 482.—*White Leghorn Utility Hens or Pullets.*

701 I.—T. R. Blackhurst, County Hotel, Lancaster.
690 II.—H. K. Michael & Son, Eau Bank P.F., North Somercotes, Louth, Lincs.
694 III.—William Hamnett, Myrtle P.F., Blackpool.
698 IV.—R. & E. Charteris, Ltd., Chobham, Woking.
700 R.N.—George E. Liddle, Hook End P.F., Kelvedon Common, Brentwood.
H.C.—696, 702. C.—692.

Class 483.—*Leghorn Utility Cocks or Cockerels, any other colour.*

703 I.—William Hamnett, Myrtle P.F., Blackpool.
706 II.—W. J. V. Searle, 9, Walton Road, East Molesey.
704 III.—W. H. Baker, School House, Tideswell, Buxton.
705 IV.—Harry Fox, International P.F., Matlock.

Class 484.—*Leghorn Utility Hens or Pullets, any other colour.*

708 I.—Tee-Side Farmers, Ltd., Salutation P.F., Coniscliffe Road, Darlington.
710 II.—William Hamnett, Myrtle P.F., Blackpool.
711 III.—W. J. V. Searle, 9, Walton Road, East Molesey.
707 IV.—R. Anthony, Euxton, Chorley, Lancs.

Class 485.—*Plymouth Rock Utility Cocks or Cockerels.*

718 I.—Joe Farnsworth, Mount Pleasant P.F., Bleasby, Nottingham.
716 II.—R. P. Harbottle, Albion House, Great Ayton, Yorks.
712 III.—W. R. Abbey & Son, Croft Farm, Hessay, York.
722 IV.—Fred W. Rogers, Penshurst, Wick Road, St. Anne's Park, Bristol.
713 R.N.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
H.C.—714, 720. C.—719, 721.

Class 486.—*Plymouth Rock Utility Hens or Pullets.*

725 I.—R. Anthony, Euxton, Chorley, Lancs.
726 II.—F. P. Haslam, Bradshaw House, Hazelwood, Derby.
724 III.—W. R. Abbey & Son, Croft Farm, Hessay, York.
723 IV.—James Lewis, 25, Church Street, Old Whittington, Chesterfield.

Class 487.—*Rhode Island Red Utility Cocks or Cockerels.*

737 I.—John Kay, Carlisle Place, Edenfield, Manchester.
731 II.—William Hamnett, Myrtle P.F., Blackpool.
732 III.—J. G. Williamson, Chester Road, Middlewich.
735 IV.—A. L. Taylor, 80, Musters Road, West Bridgford, Notts.
730 R.N.—Mrs. C. A Dennett, West Lodge, Woodthorpe Drive, Nottingham.
H.C.—729, 733, 738. C.—734, 736.

Class 488.—*Rhode Island Red Utility Hens or Pullets.*

746 I.—William Hamnett, Myrtle P.F., Blackpool.
747 II.—Mrs. C. A. Dennett, West Lodge, Woodthorpe Drive, Nottingham.
748 III.—Mrs. F. M. Heathfield, The Vale P.F., Plungar, Nottingham.
750 IV.—J. G. Williamson, Chester Road, Middlewich.
744 R.N.—W. R. Abbey & Son, Croft Farm, Hessay, York.
H.C.—752, 753, 754, 757. C.—741.

Class 489.—*Sussex Utility Cocks or Cockerels.*

758 I. and 763 II.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
767 III.—R. Anthony, Euxton, Chorley, Lancs.
765 IV.—Col. D. A. Chaytor, Pooley Hall, Polesworth, Tamworth.
764 R.N.—Henry Underwood, Mowshurst P.F., Edenbridge.
H.C.—759.

Class 490.—*Sussex Utility Hens or Pullets.*

769 I. and 774 IV.—Sir Gomer Berry, Bart., Pendley Stock Farms, Tring.
775 II. and 768 III.—Col. D. A. Chaytor, Pooley Hall, Polesworth, Tamworth.
778 R.N.—Henry Underwood, Mowshurst P.F., Edenbridge.
H.C.—770, 771, 779.

Class 491.—*Light Utility Cocks or Cockerels, any other variety.*

782 I.—A. Rice, Wollaston, Wellingborough. Ancona.
781 II.—R. Fletcher Hearnshaw, Burton Joyce, Nottingham. Scots Grey.
783 III.—The Rev. E. R. O. Bridgeman, Blymhill Rectory, Shifnal. Andalusian.
786 IV.—T. Davies, Llainddelw, Llandyssul. Ancona.
H.C.—780, 785.

Class 492.—*Light Utility Hens or Pullets, any other variety.*

790 I.—R. Fletcher Hearnshaw, Burton Joyce, Nottingham. Scots Grey.
787 II.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe. Minorca.
789 III.—William Hamnett, Myrtle P.F., Blackpool. Ancona.
796 IV.—George Goodall, Christleton, Chester. Ancona.
798 R.N.—The Rev. E. R. O. Bridgeman, Blymhill Rectory, Shifnal. Andalusian.
H.C.—788, 791, 792. C.—794, 795.

Class 493.—*Heavy Utility Cocks or Cockerels, any other variety.*

799 I.—A. J. Major, Ditton, Langley, Bucks. Dorking.
800 II.—Mrs. E. Mills, Woodford Hall, Milton Damarel, Devon. Croad Langshan.
797 III.—Joe Farnsworth, Mount Pleasant P.F., Bleasby, Nottingham. Croad Langshan.
798 IV.—W. E. Platten, Hill Farm, Little Ryburgh, Fakenham. Indian Game.
801 R.N.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe. Orpington.
H.C.—802.

Class 494.—*Heavy Utility Hens or Pullets, any other variety.*

811 I.—R. Anthony, Euxton, Chorley, Lancs. Croad Langshan.
806 II.—C. N. Belbin, Nortonthorpe Hall, Huddersfield. Barnevelder.
803 III.—E. & P. Ainley, Ferndale P.F., Verandah Lodge, Horley. Blue Orpington.
804 IV.—W. E. Platten, Hill Farm, Little Ryburgh, Fakenham. Indian Game.
805 R.N.—Mrs. E. Mills, Woodford Hall, Milton Damarel, Devon. Croad Langshan.
H.C.—807, 808, 809. C.—810.

Class 495.—*Light Utility Hens.*[1]

812 I. and 815 R.N.—William Hamnett, Myrtle P.F., Blackpool. White Leghorns.
816 II.—H. R. Bakewell, Croft P.F., Sudbury, Derby. White Leghorn.
814 III.—R. & E. Charteris, Ltd., Chobham, Woking. White Leghorn.
817 IV.—William Hamnett. Black Leghorn.
H.C.—818.

Class 496.—*Heavy Utility Hens.*[1]

821 I.—Eveline W. Jenkins, Great Barton, Bury St. Edmunds. White Wyandotte.
819 II.—C. N. Belbin, Nortonthorpe Hall, Huddersfield. Buff Plymouth Rock.
824 III.—J. G. Lawson, Rosslyn P.F., Lancaster Road, Preston Old Road, Marton, Blackpool. Rhode Island Red.
825 IV.—William Hamnett, Myrtle P.F., Blackpool. White Wyandotte.
820 R.N.—J. G. Lawson. White Wyandotte.
H.C.—828.

Class 497.—*Utility Breeding Pens. Any Variety Light Breed.*

827 I.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe. Leghorn.
829 II.—Austen Walker, Croxton Park, Grantham. Leghorn.

Class 498.—*Utility Breeding Pens. Any Variety Heavy Breed.*

831 I.—Col. Humphrey Watts, O.B.E., Haslington Hall, Crewe. Wyandotte.
832 II.—William Hamnett, Myrtle P.F., Blackpool. Wyandotte.
834 III.—J. F. S. Dalby, 54, Shardlow Road, Alvaston, Derby. Wyandotte.
833 IV.—Austen Walker, Croxton Park, Grantham. Light Sussex.

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[1] Classes 495 and 496 are for birds that have secured the Copper Ring issued by the National Poultry Council, and Exhibits must wear the ring to be eligible to compete.

Class 499.—*Aylesbury, Pekin or Rouen Drakes.*

837 I. and 840 R.N.—James Longson & Sons, Buxton Road, Chapel-en-le-Frith, Aylesbury.
839 II. and 836 IV.—R. Anthony, Euxton, Chorley, Lancs. Rouen.
841 III.—Joseph Hallam, Whitehough, Chinley, Stockport. Pekin.
H.C.—838.

Class 500.—*Aylesbury, Pekin or Rouen Ducks.*

842 I. and 846 II.—R. Anthony, Euxton, Chorley, Lancs. Rouen.
845 III.—James Longson & Sons, Buxton Road, Chapel-en-le-Frith. Aylesbury.
844 IV.—R. Barker, Lodge P.F., High Street, Long Eaton. Aylesbury.
847 R.N.—Mrs. Amy Elce, Barings Field, Newdigate, Surrey. Aylesbury.
H.C.—843.

Class 501.—*Indian Runner Drakes or Ducks, bred prior to* 1933.

850 I.—Fred Argo, Bructor, Inverurie.
854 II.—R. Anthony, Euxton, Chorley, Lancs.
855 III.—Mrs. W. G. Jacka, Ninnis, Germoe, Marazion.
853 IV.—H. Hough-Watson, Braystones House, Beckermet.
848 R.N.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
H.C.—851, 856.

Class 502.—*Indian Runner Drakes or Ducks, bred in* 1933.

860 I.—The Rev. J. Hewetson, Burbage Vicarage, Buxton.
863 II—R. Anthony, Euxton, Chorley, Lancs.
859 III—Fred Argo, Bructor, Inverurie.
861 IV.—Reginald Appleyard, Priory Waterfowl Farm, Ixworth, Bury St. Edmunds

Class 503.—*Drakes, any other variety.*

873 I.—R. Anthony, Euxton, Chorley, Lancs. Buff Orpington.
869 II.—Wm. Richardson, 40, Bootham Crescent, York. Cayuga.
875 III.—J. P. Bleazard, New Close, Downham, Clitheroe. Khaki Campbell.
874 IV.—S. T. Briddon, Knowts Hall Farm, Riddings, Derbyshire. Magpie.
H.C.—867, 868, 876.

Class 504.—*Ducks, any other variety.*

880 I.—John H. Butler, Gatcombe, Flax Bourton, Bristol. Khaki Campbell.
877 II.—A. H. Fox-Brockbank, The Croft, Kirksanton, Millom. Muscovy.
878 III.—Wm. Richardson, 40, Bootham Crescent, York. Cayuga.
882 IV.—Major L. C. Chawner, Little Barrs, New Milton, Hants. Cayuga.
886 R.N.—R. Anthony, Euxton, Chorley, Lancs. Khaki Campbell.
H.C.—883.

Class 505.—*Embden Ganders or Geese.*

887 I.—A. H. Fox-Brockbank, The Croft, Kirksanton, Millom.
890 II.—J. M. Abbot, Thuxton, Norfolk.
892 III. and 888 IV.—Capt. N. Milne Harrop, Garthgynan, Ruthin.
889 R.N.—Reginald Appleyard, Priory Waterfowl Farm, Ixworth, Bury St. Edmunds.
H.C.—891.

Class 506.—*Toulouse Ganders or Geese.*

897 I.—J. M. Abbot, Thuxton, Norfolk.
896 II.—G. H. Barker, Thorpe Arnold, Melton Mowbray.
898 III.—H. Whitley, Primley, Paignton.
895 IV.—Mrs. K. Amsden, Oaklawn P.F., Hildenborough, Tonbridge.
894 R.N.—Reginald Appleyard, Priory Waterfowl Farm, Ixworth, Bury St. Edmunds.
H.C.—899.

Class 507.—*Turkey Cocks.*

900 I.—Harry Abbot, Live Stock Farm, Thuxton, Norfolk.
906 II.—H. Whitley, Primley, Paignton.
904 III.—Mrs. Jessie Andrew, South Tulloford, Old Meldrum.
901 IV.—F. E. Hughes, Common Farm, Langley Burrell, Chippenham.
905 R.N.—A. Hinton, The Fields, Wheelock Heath, Sandbach.
H.C.—907.

Class 508.—*Turkey Hens.*

913 I.—H. Whitley, Primley, Paignton.
908 II.—Harry Abbot, Live Stock Farm, Thuxton, Norfolk.
909 III.—Mrs. Amy Elce, Barings Field, Newdigate, Surrey.
910 IV.—Brogyntyn Estate Co., Brogyntyn, Oswestry.
914 R.N.—J. M. Abbot, Thuxton, Norfolk.
H.C.—911, 912.

Class 509.—*Modern Game Bantam Cocks or Cockerels.*

916 I. and 920 IV.—Robert Hirst, The Royds, Cleckheaton.
917 II.—R. Fletcher Hearnshaw, Burton Joyce, Nottingham.
915 III.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
918 R.N.—W. H. W. Parsons, 65, Albert Street, Rugby.
H.C.—919.

Class 510.—*Modern Game Bantam Hens or Pullets.*

921 I.—R. Fletcher Hearnshaw, Burton Joyce, Nottingham.
923 II.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
922 III. and 926 R.N.—Robert Hirst, The Royds, Cleckheaton.
925 IV.—W. H. W. Parsons, 65, Albert Street, Rugby.
H.C.—924.

Class 511.—*Old English Game Bantam Cocks or Cockerels.*

932 I. and 928 II.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
929 III.—Master Allen, Riversdale, Belper, Derby.
931 IV.—G. W. Platts, c/o W. H. Moore & Sons, Matlock.
933 R.N.—J. H. Moorhouse, Kitson Hill, Mirfield.
H.C.—927. C.—930.

Class 512.—*Old English Game Bantam Hens or Pullets.*

935 I. and 940 III.—C. N. Belbin, Nortonthorpe Hall, Huddersfield.
939 II.—Miss M. Wenger, Trentham, Stoke-on-Trent.
937 IV.—R. Fletcher Hearnshaw, Burton Joyce, Nottingham.
938 R.N.—Rhys Llewellyn, St. Fagans Court, Glam.
H.C.—936. C.—934.

Class 513.—*Wyandotte Bantam Cocks or Cockerels.*

946 I.—E. Whitaker, Park Farm, Mytholmroyd.
942 II.—Daniel Ashcroft, Lympstone, Berechurch, Colchester.
943 III.—T. Murfin, 121, Nuttall's Park, Ripley, Derby.
945 IV.—H. Hough-Watson, Braystones House, Beckermet.
941 R.N.—R. Fletcher Hearnshaw, Burton Joyce, Nottingham.
H.C.—944.

Class 514.—*Wyandotte Bantam Hens or Pullets.*

950 I.—T. Murfin, 121, Nuttall's Park, Ripley, Derby.
951 II.—E. Whittaker, Park Farm, Mytholmroyd.
947 III.—T. H. Sheldon, The Grove, Cropwell Butler, Nottingham.
948 IV.—F. R. Maskery, 58, St. Edward Street, Leek.
949 R.N.—R. Fletcher Hearnshaw, Burton Joyce, Nottingham.

Class 515.—*Sebright Bantam Cocks or Cockerels.*

954 I.—J. H. Heys, West Ville, Ainsdale, Southport.
953 II. and 956 III.—T. H. Sheldon, The Grove, Cropwell Butler, Nottingham.
955 IV.—Robert Bennett, The Butts, Frome.

Class 516.—*Sebright Bantam Hens or Pullets.*

959 I.—J. H. Heys, West Ville, Ainsdale, Southport.
957 II.—Miss A. Poingdestre, 6, Ford Bridge Road, Ashford, Middlesex.
958 III. and 961 R.N.—T. H. Sheldon, The Grove, Cropwell Butler, Nottingham.
962 IV.—Robert Bennett, The Butts, Frome.

Class 517.—*Bantam Cocks or Cockerels, any other variety.*

967 I. and 971 R.N.—Geo. L. Booth, Harrop Farm, Wilsden, Bradford.
965 II.—R. Fletcher Hearnshaw, Burton Joyce, Nottingham. Barbu d'Anvers.
964 III.—H. Hough-Watson, Braystones House, Beckermet. Polish.
963 IV.—C. N. Belbin, Nortonthorpe Hall, Huddersfield. Indian Game.
H.C.—970. C.—968.

Class 518.—*Bantam Hens or Pullets, any other variety.*

975 I. and 980 III.—Geo. L. Booth, Harrop Farm, Wilsden, Bradford.
979 II.—G. W. Platts, c/o W. H. Moore & Sons, Matlock. Pekin.
981 IV.—W. O. Furber, Dove Cottage, Thorpe Cloud, Ashbourne. Hamburgh.
977 R.N.—J. H. Heys, West Ville, Ainsdale, Southport. Black Rosecomb.
H.C.—972, 973, 976. C.—974, 983, 984.

FARM AND DAIRY PRODUCE OF THE UNITED KINGDOM.

The Prizes in each Class for Butter are as follows : First Prize, £3 ; Second Prize, £2 ; Third Prize, £1.

Butter.

Class 519.—*Two pounds of Fresh Butter, without any salt, made up in plain pounds, from the milk of Channel Island, Devon or South Devon Cattle and their crosses.*

4 **I.**—A. G. Dennis, Lower Pulworthy, Highampton, Beaworthy.
2 **II.**—Mrs. E. B. Beer, Puddaven, Totnes.
3 **III.**—Mrs. G. Blackler, West Leigh, Modbury.
12 **R.N.**—Miss M. M. Varker, Fraddam, Gwinear, Hayle.
H.C.—1, 11, 13. **C.**—5, 7.

Class 520.—*Two pounds of Fresh Butter, without any salt, made up in plain pounds, from the milk of cattle of any breed or cross other than those mentioned in Class* 519.

15 **I.**—Mrs. B. Dennis, Pulworthy, Highampton, Beaworthy.
18 **II.**—Miss P. L. Mudd, Slade House, Darley, Harrogate.
14 **III.**—Gervase Brown, The Hollies, Milton, Derby.
19 **R.N.**—Miss A. M. Ward, Foggathorpe Hall Farm, Selby.
H.C.—20.

Class 521.—*Two pounds of Fresh Butter, slightly salted, made up in plain pounds, from the milk of Channel Island, Devon or South Devon Cattle and their crosses.*

24 **I.**—A. G. Dennis, Lower Pulworthy, Highampton, Beaworthy.
22 **II.**—Mrs. E. B. Beer, Puddaven, Totnes.
32 **III.**—Miss M. M. Varker, Fraddam, Gwinear, Hayle.
23 **R.N.**—Mrs. G. Blackber, West Leigh, Modbury.
H.C.—21, 30. **C.**—31, 33.

Class 522.—*Two pounds of Fresh Butter, slightly salted, made up in plain pounds, from the milk of cattle of any breed or cross other than those mentioned in Class* 521.

43 **I.**—Mrs. Ellen Turner, The Hall Farm, Palterton, Chesterfield.
41 **II.**—Miss P. L. Mudd, Slade House, Darley, Harrogate.
37 **III.**—Mrs. B. Dennis, Pulworthy, Highampton, Beaworthy.
34 **R.N.**—Mrs. S. J. Beadle, Broadless Gate, Newbiggin, Middleton-in-Teesdale.
H.C.—36. **C.**—42, 44.

Class 523.—*Three pounds of Fresh Butter, slightly salted, made up in pounds in the most attractive marketable designs.*

46 **I.**—Mrs. E. B. Beer, Puddaven, Totnes.
49 **II.**—Miss M. M. Varker, Fraddam, Gwinear, Hayle.
50 **III.**—Miss A. M. Ward, Foggathorpe Hall Farm, Selby.
47 **R.N.**—Mrs. J. Mogford, Overcott, Rose Ash, South Molton.
H.C.—45. **C.**—48.

Cheese.

Made in 1933.

Unless otherwise stated the Prizes in each Class for Cheese are as follows : First Prize, £5 ; Second Prize, £3 ; Third Prize, £2 ; Fourth Prize, 10s. ; Fifth Prize, 5s.

Class 524.—*Two Cheshire Cheeses, coloured, not less than* 40 *lb. each.*

57 **I.**—W. E. Moore, Baddiley Farm, Nantwich.
52 **II.**—Arthur Barnett, Rose Farm, Worleston, Nantwich.
56 **III.**—Fred Huntbach, Moor Hall, Aston, Nantwich.
55 **IV.**—W. H. Hobson, Woodhey Hall, Nantwich.
53 **V.**—W. E. Blake, Cross Lanes, Bickley, Malpas.
61 **R.N.**—P. H. Walley, Towns Green, Wettenhall, Winsford, Cheshire.
H.C.—58. **C.**—62.

Class 525.—*Two Cheshire Cheeses, uncoloured, not less than* 40 *lb. each.*

67 I.—W. H. Hobson, Woodhey Hall, Nantwich.
69 II.—W. E. Moore, Baddiley Farm, Nantwich.
73 III.—P. H. Walley, Towns Green, Wettenhall, Winsford.
65 IV.—W. E. Blake, Cross Lanes, Bickley, Malpas.
64 V.—Arthur Barnett, Rose Farm, Worleston, Nantwich.
66 R.N.—T. Darlington, Marshfield Bank Farm, Woolstanwood, Crewe.
H.C.—71. C.—75.

Class 526.—*Two Cheddar Cheeses, not less than* 50 *lb. each.*

77 I.—Frank Portch, Leigh Farm, Wincanton.
78 II.—Sidney T. White, Stock Dennis Farm, Ilchester.

Class 527.—*Two Cheddar Truckles.*

81 I.—Mrs. S. A. Harris, Nantyderry, Abergavenny.
84 II.—Sidney T. White, Stock Dennis Farm, Ilchester.
82 III.—A. H. Hunt, Dropping Lane Farm, Bruton.
79 R.N.—W. J. Emery, Swallowpitts Farm, Emborough, Bath.

Class 528.—*Two Staffordshire or Derbyshire Cheeses.*

85 I.—Cheddar Valley Dairy Co., Ltd., Rooksbridge, Axbridge.
87 II.—J. M. Nuttall & Co., Ltd., Dove Dairy, Hartington, Buxton.
86 III.—Derbyshire Farmers, Ltd., Willington, Derby.
90 R.N.—Stephen Truelove, Gate Farm, Monks Kirby, Rugby.

Class 529.—*Two Leicestershire Cheeses.*

91 I.—Mrs. A. J. Bolshaw, Hornhill Farm, Clipston, Market Harborough.
92 II.—Mrs. Alice May Dyke, Glebe Farm, Ratcliffe Caley, Atherstone.
96 III.—Francis W. Tomlinson, Hall Farm, Ullesthorpe, Rugby.
97 R.N.—Stephen Truelove, Gate Farm, Monks Kirby, Rugby.

Class 530.—*Two Stilton Cheeses.*

99 I.—Emberlin & Co., Ltd., The Dairy, Old Dalby, Melton Mowbray.
107 II.—Wilts. United Dairies, Ltd., The Dairy, Swepstone, Leicester.
98 III.—Emberlin & Co., Ltd., The Dairy, Wymeswold, Loughborough.
100 IV.—Long Clawson Dairy, Ltd., Hose, Melton Mowbray.
102 R.N.—J. M. Nuttall & Co., Ltd., Dove Dairy, Hartington, Buxton.

Class 531.—*Two Wensleydale Cheeses, Stilton shape.*

111 I.—Alfred Rowntree & Sons, Coverham, Middleham.
108 II.—Mrs. S. A. Harris, Nantyderry, Abergavenny.
110 III.—Miss B. J. Mudd, Aldborough Dairy, Boroughbridge.
109 R.N.—Miss Rachel James, Llancayo, Usk, Mon.

Class 532.—*Two Caerphilly Cheeses.*

115 I.—Mrs. Sina John, Ruthin Farm, Pencoed, Bridgend.
116 II.—Miss Magen Jones, Ruthin Farm, Pencoed, Bridgend.
118 III.—Mrs. S. A. Harris, Nantyderry, Abergavenny.
114 R.N.—Miss Rachel James, Llancayo, Usk, Mon.

Class 533.—*Two Small Cheeses, not exceeding* 6 *lb. each, of Cheddar or Cheshire character.*

120 I. (£4).—Mrs. S. A. Harris, Nantyderry, Abergavenny.
127 II. (£2).—Sidney T. White, Stock Dennis Farm, Ilchester.
121 III. (£1).—A. H. Hunt, Dropping Lane Farm, Bruton.
126 IV. (10s.).—P. H. Walley, Towns Green, Wettenhall, Winsford.
128 R.N.—H. S. & W. G. Whittaker, Wardle Bridge Farm, Nantwich.

Class 534.—*Two Small Cheeses, not exceeding* 6 *lb. each, of Stilton or Wensleydale character.*

138 I. (£4).—J. M. Nuttall & Co., Ltd., Dove Dairy, Hartington, Buxton.
135 II. (£2).—Long Clawson Dairy, Ltd., Long Clawson, Melton Mowbray.
134 III. (£1).—Long Clawson Dairy, Ltd., Hose, Melton Mowbray.
132 IV. (10s.).—Mrs. S. A. Harris, Nantyderry, Abergavenny.
133 V. (5s.).—Miss Rachel James, Llancayo, Usk, Mon.
137 R.N.—Miss P. L. Mudd, Slade House, Darley, Harrogate.

Class 535.—*Two Soft Cheeses, made from whole milk.*

151 I. (£4).—Francis W. Tomlinson, Hall Farm, Ullesthorpe, Rugby.
147 II. (£2).—Miss Rachel James, Llancayo, Usk, Mon.
150 III. (£1).—Mrs. Janet Watt Pantall, The Lilac Dairy, Widemarsh Street, Hereford.
143 R.N.—Miss E. Allday, Fotheringhay Manor Farm, Peterborough.
H.C.—146. C.—144, 149.

Class 536.—*Two Cheeses made from cream without the addition of rennet.*

154 I. (£4).—Mrs. V. Morse, Upper Cowden, Five Ashes, Sussex.
153 II. (£2).—Mrs. H. Crosby, Auburn House, West Rounton, Northallerton.
152 III. (£1).—His Majesty The King, Sandringham.

Cider.

The Prizes in each Class for Cider are as follows: First Prize, £3; Second Prize, £2; Third Prize, £1; Fourth Prize, 10s.; Fifth Prize, 5s.

Class 537.—*Casks of Cider, not less than* 6 *gallons, made in* 1932 *by a bona-fide Farmer.*

157 I.—H. W. Davis, Sutton Montis, Yeovil.

Class 538.—*Six Bottles of Dry Cider, made in* 1932.

160 I.—Sir John H. Amory, Bart., Knightshayes Court, Tiverton.
166 II.—Quantock Vale Cider Co., Ltd., North Petherton, Somerset.
167 III.—Severn Vale Cider Co., Ltd., Bushley, Gloucester.

Class 539.—*Six Bottles of Sweet Cider, made in* 1932.

179 I.—Pullin Bros., Spaniorum Farm, Compton Greenfield, Bristol.
182 II.—Severn Vale Cider Co., Ltd., Bushley, Gloucester.
170 III. and 172 V.—Sir John H. Amory, Bart., Knightshayes Court, Tiverton.
174 IV.—H. W. Davis, Sutton Montis, Yeovil.
177 R.N.—Mitchell, Toms & Co., Ltd., Chard, Somerset.

Class 540.—*Six Bottles of Cider, made previous to* 1932.

189 I.—Henry M. Lang & Co., Hambridge Brewery, Curry Rivel, Somerset.
191 II.—Severn Vale Cider Co., Ltd., Bushley, Gloucester.
188 III. and 186 R.N.—Sir John H. Amory, Bart., Knightshayes Court, Tiverton.
190 IV.—Mitchell, Toms & Co., Ltd., Chard, Somerset.

Wool.[1]

Of 1933 clip.

First Prize, £3; Second Prize, £2; Third Prize, £1, in each Class.

Class 541.—*Three Fleeces of Oxford Down Wool.*

198 I. and 199 II.—H. W. Stilgoe, The Grounds, Adderbury, Banbury.
196 III.—Lawrence B. Akers, Litchfield Farm, Enstone, Oxford.

Class 542.—*Three Fleeces of Shropshire Wool.*

203 I.—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shrewsbury.
202 II.—John Minton, Dryton, Wroxeter, Shrewsbury.
200 III.—John M. Belcher, Tibberton Grange, Wellington, Shropshire.

Class 543.—*Three Fleeces of Southdown Wool.*

204 I. & 'Champion[2] and 205 II. & R.N. for Champion.[2]—His Majesty The King, Sandringham.
209 III.—John Pierpont Morgan, Wall Hall, Watford.
H.C.—210.

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[1] The Second and Third Prizes in these Classes were given by the respective Flock Book Societies.

[2] Special Cash Prize, known as the "Merchants of the Staple of England" Prize, given for the best fleece taken from any short-woolled breed of sheep.

Class 544.—*Three Fleeces of Hampshire Down Wool.*

215 I. and 214 III.—E. Clifton-Brown, Burnham Grove, Burnham, Bucks.
217 II.—William Todd, Little Ponton Grange, Grantham.

Class 546.—*Three Fleeces of Dorset Down Wool.*

219 I.—The Earl of Elgin, K.T., Broomhall, Dunfermline.
221 II. and 220 III.—Leonard Tory, Turnworth, Blandford.

Class 547.—*Three Fleeces of Dorset Horn Wool.*

222 I.—The Earl of Elgin, K.T., Broomhall, Dunfermline.
224 II. and 223 III.—Alfred Read, Lower Farm, Hilton, Blandford.

Class 548.—*Three Fleeces of Ryeland Wool.*

227 I.—David J. Thomas, Monachty, Abergavenny.
226 II. and 225 III.—T. W. Montague Perkins, Ufton Court, Holme Lacy, Hereford.

Class 549.—*Three Fleeces of Kerry Hill (Wales) Wool.*

229 I.—John T. Beavan, Winsbury, Chirbury, Montgomery.
231 II.—John W. Owens, Woodhouse, Shobdon, Herefordshire.
230 III.—J. Albert Frost, New Hall Farm, Sutton Coldfield.

Class 550.—*Three Fleeces of Lincoln Wool.*

234 I. & **Champion.**[1]—Clifford Nicholson, Willoughton Manor, Lincoln.
232 II. and 233 III.—D. F. Browett, Thornton, Horncastle.

Class 552.—*Three Fleeces of Wensleydale Wool.*

238 I.—**R.N. for Champion.**[1]—John A. Willis, Manor House, Carperby, Yorks.
236 II.—John Percival, Easthouse, Carperby, Yorks.
235 III.—John Wm. Greensit, Holme-on-Swale, Thirsk.

Class 553.—*Three Fleeces of Kent or Romney Marsh Wool, from Rams of any age.*

242 I.—Ashley Stevens, Davington Hall, Faversham, Kent.
241 II.—J. Egerton Quested, The Firs, Cheriton, Kent.
240 III.—L. H. & G. W. Finn, The Mall, Faversham, Kent.

Class 554.—*Three Fleeces of Kent or Romney Marsh Wool from Ewe Tegs.*

245 I.—Clifford Nicholson, Willoughton Manor, Lincoln.
247 II.—Ashley Stevens, Davington Hall, Faversham, Kent.
248 III.—E. W. Baker, Bekesbourne, Canterbury.

Class 555.—*Three Fleeces of Kent or Romney Marsh Wool, excluding Rams and Ewe Tegs.*

253 I.—Ashley Stevens, Davington Hall, Faversham, Kent.
250 II. and 249 III.—L. H. & G. W. Finn, The Mall, Faversham, Kent.
H.C.—252.

Class 556.—*Three Fleeces of Welsh Mountain Wool.*

259 I.—Joe K. Williamson, Derwen Hall, Corwen.
256 II.—Major Eric J. W. Platt, Madryn Farm, Aber, Caernarvonshire.
254 III.—Lord Penrhyn, Penrhyn Castle, Bangor.
H.C.—257.

Class 557.—*Three Fleeces of Black Welsh Mountain Wool.*

264 I.—Mrs. Jervoise, Herriard Park, Basingstoke.
263 II.—Major F. H. T. Jervoise, Herriard Park, Basingstoke.
261 III.—Miss J. V. Horn, Woodcote Park, Blackshiels, Midlothian.

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[1] Special Cash Prize, known as the "Merchants of the Staple of England" Prize, given for the best fleece taken from any long-woolled breed of sheep.

BUTTER-MAKING COMPETITIONS.

Class 1.—*Open to Students who have received not less than one month's instruction at any Dairy School and who have not won a First or Second Prize at the R.A.S.E., London Dairy, Bath and West, Royal Counties, Royal Lancashire or Yorkshire Shows.*

Section A.

10 I. (£4).—Miss Margaret Constance, Courtfield, Longhope, Glos.
23 II. (£3).—Mrs. E. Gwendoline Griffiths, Spellis Farm, Hindlip, Worcester.
11 III. (£2).—Miss Marie E. Davies, The Hole Farm, Halfway House, Shropshire.
21 IV. (£1).—Miss Olga Eustice, Bezurrel, Gwinear, Hayle.
7 R.N.—Miss Kathleen Colwill, The Dingle, Little Witley, Worcester.
H.C.—8, 18, 19, 22. C.—14, 15.

Section B.

32 I. (£4).—Miss Sadie T. Lewis, Blackfields Farm, Broadwas-on-Teme, Worcs.
31 II. (£3).—Miss Flossie Lewis, Court Farm, Llanmartin, Newport, Mon.
41 III. (£2).—Miss Lorraine Rogers, Monmouthshire Agricultural Institute, Usk.
33 IV. (£1).—Miss H. M. Miles, Edenwall Farm, Coleford, Glos.
43 R.N.—Miss Edith Tucker, Lower Tundridge, Suckley, Worcester.
H.C.—36, 39. C.—38, 45.

Class 2.—*Open to those who have not won a First or Second Prize at any Show.*

Section A.

62 I. (£4).—Miss Olga Eustice, Bezurrell, Gwinear, Hayle.
60 II. (£3).—Miss Margaret Edwards, Humber Court, Leominster.
59 III. (£2).—Miss Doris Edwards, Monmouthshire Agricultural Institute, Usk.
66 IV. (£1).—Miss Daisy Grooby, Burley, Oakham.
64 R.N.—Miss Lena Griffiths, Monmouthshire Agricultural Institute, Usk.
H.C.—52, 55. C.—48, 53.

Section B.

75 I. (£4).—Miss Jane M. Olde, Clifton House, Boscastle, Cornwall.
69 II. (£3).—Miss M. Joslin, Stone, Brayford, Barnstaple.
82 III. (£2).—Miss E. Gertrude Ap Thomas, Cheshire School of Agriculture, Reaseheath, Nantwich.
70 IV. (£1).—Miss Flossie Lewis, Court Farm, Llanmartin, Newport, Mon.
85 R.N.—Miss Gwendoline Williams, Monmouthshire Agricultural Institute, Usk.
H.C.—78, 79. C.—71, 83.

Class 3.—*Open, except to Champions at the R.A.S.E., London Dairy, Bath and West, Royal Counties, Royal Lancashire or Yorkshire Shows.*

Section A.

112 I. (£5).—Miss Marie Julian, Tredinnick, Duloe, Cornwall.
95 II. (£4).—Miss J. K. Cruddas, St. Anne's, Dunmere, Bodmin.
90 III. (£3).—Miss E. Birchall, Lancs. C.C. College, Hutton, Preston.
92 IV. (£2).—Miss Ethel Challonger, Greenhill Farm, Woolhope, Ledbury.
103 V. (£1).—Miss Olga Eustice, Bezurrell, Gwinear, Hayle.
94 R.N.—Miss Kathleen Crow, Eastburn, Driffield.
H.C.—91, 113. C.—88, 98.

Section B.

116 I. (£5).—Miss Mary Lumley, Lancs. C.C. College, Hutton, Preston.
128 II. (£4).—Miss M. E. Sandercock, Venterdon, Stokeclimsland, Callington, Cornwall.
120 III. (£3).—Mrs. A. Mogford, Overcott, Rose Ash, South Molton.
130 IV. (£2).—Miss Sidwell M. Stephens, St. Winnow, Barton, Lostwithiel.
115 V. (£1).—Miss Sadie T. Lewis, Blackfields Farm, Broadwas-on-Teme, Worcs.
124 R.N.—Miss P. Peer, Rectory Farm, Tibberton, Droitwich.
H.C.—119, 131. C.—125, 136.

Class 4.—*Inter-County Championship for teams of three, one of whom must be a Novice never having won a First or Second Prize up to the time of entry, the second member must not have won more than three First Prizes and must never have won any Championship, the third member may be a Champion at this or any Show.*

139 **I. (£3 & Silver Medal each).**—
Miss S. M. Stephens, St. Winnow, Barton, Lostwithiel.
Miss J. K. Cruddas, St. Anne's, Dunmere, Bodmin.
Miss Olga Eustice, Bezurrell, Gwinear, Hayle.

140 **II. (£2 each).**—
Miss Muriel Joslin, Stone, Brayford, Barnstaple.
Miss Mary E. Davies, Kersford Barton, Bridestowe.
Mrs. A. Mogford, Overcott, Rose Ash, South Molton.

141 **III. (£1 each).**—
Miss Kathleen Webb, The Farm, Hardwicke, Gloucester.
Miss H. M. Miles, Edenwall Farm, Coleford.
Miss Margaret Constance, Courtfield, Longhope.

145 **R.N.**—
Miss Mabel Edwards, Walsgrove, Great Witley, Worcester.
Miss Kathleen Colwill, The Dingle, Little Witley, Worcester.
Miss Phyllis Peer, Rectory Farm, Tibberton, Droitwich.

H.C.—143. **C.**—142, 144.

Class 5.—*Championship open to the First Prize Winners in the preceding Classes or at any previous R.A.S.E. Show, and to Champions of the London Dairy, Bath and West, Royal Counties, or any County Show.*

158 **I. (£5 & Gold Medal).**—Miss Mabel K. Stratton, Charlton, Pershore.
157 **II. (£4).**—Miss Sidwell M. Stephens, St. Winnow, Barton, Lostwithiel.
116 **III. (£3).**—Miss Mary Lumley, Lancs. C.C. College, Hutton, Preston.
151 **IV. (£2).**—Miss Sybil E. Jones, Cwm, Crickhowell.
154 **V. (£1).**—Mrs. A. Mogford, Overcott, Rose Ash, South Molton.
148 **R.N.**—Miss M. E. Davies, Llysfasi Farm Institute, Ruthin.
H.C.—146, 152. **C.**—139, 153.

FLOWER SHOW.

Class 1.—*Groups of Miscellaneous Plants.*

3 **I. (£40).**—J. A. C. Roy, Cheadle Royal Gardens, Cheadle, Cheshire.
1 **II. (£30).**—J. Cypher & Sons, Queen's Road Nurseries, Cheltenham.
2 **III. (£10).**—T. M. Petch, Highfield Nursery, Great Norton, Bradford.

Class 2.—*Collections of Delphiniums.*

5 **I. (£6).**—Wheatcroft Bros., Ltd., Gedling, Nottingham.

Class 3.—*Groups of Tuberous Begonias in pots.*

6 **I. (£20).**—Blackmore & Langdon, Bath.

Class 4.—*Groups of Aquatic and Semi-Aquatic Plants.*

9 **I. (£20).**—M. Prichard & Sons, Ltd., Riverslea Nurseries, Christchurch, Hants.
10 **II. (£15).**—Stephen Sims, Draycott, Derbyshire.
68 **III. (£10).**—C. H. Tandevin, Ltd., Raby Flower Farm, Willaston, Wirral, Cheshire.

Class 5.—*Collections of Hardy Perennial Plants and Cut Blooms.*

12 **I. (£30).**—Bees, Ltd., Sealand Nurseries, Chester.
11 **II. (£25).**—Wm. Artindale & Son, Nether Green, Sheffield.
17 **III. (£20).**—Suffolk Seed Stores, Ltd., Woodbridge.
14 **IV. (£5).**—Hewitt & Co., Ltd., Solihull, Warwickshire.
16 **V. (£5).**—M. Prichard & Sons, Ltd., Riverslea Nurseries, Christchurch, Hants.
13 **VI. (£2 10s.).**—Gayborder Nurseries, Melbourn, Derbyshire.

Class 6.—*Collections of Tree Carnations.*

18 **I. (£15 & Cup.[1])**—Allwood Bros., Wivelsfield Nurseries, Haywards Heath.
19 **II. (£10).**—C. Engelmann, Ltd., Saffron Walden.

Class 7.—*Collections of Cut Sprays of Border Carnations.*

21 **I. (£15).**—Horace Lakeman, Queensberry Nursery, Thornton Heath.

Class 8.—*Collections of Sweet Peas.*

23 **I. (£15).**—Ralph Challinor, The Gardens, Lilleshall, Wellington, Shropshire.
22 **II. (£10).**—G. H. Brookshaw, Stock Lane, Hough, Crewe.
25 **III. (£5).**—T. Wadsworth & Son, Bishop Wilton, York.

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[1] Perpetual Challenge Cup awarded to the First Prize Winner in Class 6.

Class 9.—*Collections of Cut Roses.*

27 I. (£15).—Charles Gregory, Chilwell, Notts.
28 II. (£10).—William Lowe & Son, The Nurseries, Beeston, Notts.
26 III. (£7).—Benjamin R. Cant & Sons, Ltd., The Old Rose Gardens, Colchester.

Exhibits not for Competition.

Large Gold Medals to :—

37 Conways, Ltd., Halifax. Rock Garden.
40 Alex. Dickson & Sons, Ltd., Hawlmark, Newtownards, Ireland. Cut Roses.
56 John Peed & Sons, West Norwood, London, S.E.27. Greenhouse Flowering and Foliage Plants.
60 Thomas Robinson, Porchester Nurseries, Nottingham. Dahlias, Roses and Shrubs.
65 Stephen Sims, Draycott, Derbyshire. Rock and Water Garden.
66 Studley College, Studley, Warwickshire. Fruits and Vegetables.
67 Sutton & Sons, Ltd., Reading. Sweet Peas and Annuals.
71 Edward Webb & Sons (Stourbridge), Ltd., Wordsley, Stourbridge. Cut Flowers, Flowering Plants and Foliage Plants.

Gold Medals to :—

31 Backhouse Nurseries (York), Ltd., York. Rock Garden.
33 Bees, Ltd., Sealand Nurseries, Chester. Delphiniums.
41 En-Tout-Cas Co. (Syston), Ltd., Syston, Leicester. Conifers.
50 Horace Lakeman, Queensberry Nursery, Thornton Heath. Cut Border Carnations.
52 Stuart Low & Co., Bush Hill Park, Enfield. Orchids, Perpetual Carnations and Malmaisons, etc.
55 Maxwell & Beale, Ltd., Broadstone, Dorset. Rock, Water and Heather Garden.
62 L. R. Russell, Ltd., Richmond Nurseries, Richmond, Surrey. Water Lilies, Aquatic and other Plants.
69 Toogood & Sons, Ltd., Southampton. Floral Display.
70 John Waterer, Sons & Crisp, Ltd., The Floral Mile, Twyford, Berks. Astilbes and Iris Kampferi.

Silver Gilt Medals to :—

30 Allwood Bros., Wivelsfield Nurseries, Haywards Heath. Carnations and Dianthus.
32 Bakers, Codsall, Wolverhampton. Delphiniums.
39 Dickson & Robinson, Ltd., Cathedral Street, Manchester. Hydrangeas.
42 John Forbes (Hawick), Ltd., Buccleugh Nurseries, Hawick. Phloxes, Pentstemons and Hardy Flowers.
44 Hillier & Sons, Winchester. Hardy Shrubs, Flowering, etc., Hardy Plants.
57 M. Prichard & Sons, Ltd., Riverslea Nurseries, Christchurch, Hants. Rock Bench of Alpine Plants.
58 R. W. Proctor & Sons, Ashgate Road Nurseries, Chesterfield. Cut Roses, including Climbers.
75 H. Woolman, Shirley, Birmingham. Dahlias.

Silver Medals to :—

34 Bowell & Skarratt, Hardy Plant Nurseries, Cheltenham. Alpines, Aquatics, etc.
38 Daniels Bros., Ltd., Norwich. Liliums, Gladioli, Perennials, etc.
43 G. Gibson & Co., Leeming Bar, Yorks. Shrubs, Herbaceous Plants, etc.
47 Kent, Brydon & Haigh, Tees Bank Nurseries, Darlington. Rock Plants, Cut Flowers, Small Shrubs, etc.
49 Laird & Dickson, Pinkhill Nurseries, Edinburgh. Rock Alpine Plants.
53 William Lowe & Son, The Nurseries, Beeston, Notts. Hardy Ornamental Shrubs and Herbaceous Plants.
54 Madresfield Gardens, Madresfield, Malvern. Polyantha Roses.
59 F. Rich, Hindlip Gardens, Worcester. Hardy Cut Flowers.
61 W. H. Rogers & Son, Ltd., Red Lodge Nursery, Bassett, Southampton. Alpines and Alpine Shrubs.
74 G. E. Welch, Huntingdon Road, Cambridge. Alpines.
77 Wells, Junr., Merstham, Surrey. Herbaceous Flowers.

IMPLEMENTS.

Silver Medals for articles entered as "New Implements for Agricultural or Estate Purposes".

240 Dunlop Rubber Co., Ltd., Fort Dunlop, Birmingham. Pneumatic Land Whee Equipment.
277 A. C. Bamlett, Ltd., Thirsk. Potato Planter.
661 John Wilder, Reading. Grass Elevator.
670 Blackstone & Co., Ltd., Rutland Engineering Works, Stamford. Potato Digger.
961 W. L. Holland, Adelphi Works, Preston. Vegetable Shredder.

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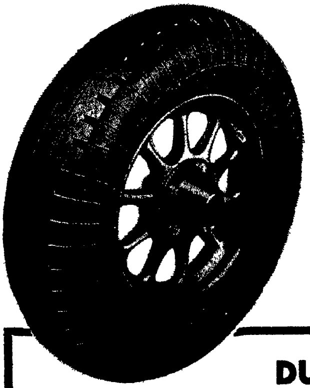

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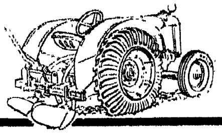

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